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Cost Keeping for the Small Shop

BY E. M. PIERCE

Overcoming the problems of the small jobber by a simple chart system — Available uses of the chart — Rejection tags and special order forms

HIGHLY efficient systems of cost keeping and control of production have been devised for the large manufacturing establishments and a vast amount of literature is available for those who wish to study such problems as they apply to the larger organizations, but comparatively little attention has been paid to the problems of the manager (frequently the owner) of the small shop, more particularly those engaged in jobbing work. This does not mean that the difficulties of the small shop are less than those of the larger firm; they are quite as hard to solve and are complicated by the necessity of keeping the cost of operating any system to the smallest possible amount. The small jobber frequently encounters more or less trouble with his customer when he presents his bill, because the latter usually fails to think of the added costs resulting from the changes and alterations that he has requested during the progress of the work. The jobber is then confronted with the problem of a lawsuit or a cut in his bill, either of which will make his profit disappear. He not only loses his profit but a customer and makes a bitter enemy as well. That means he must go out and find new customers and fight against the reputation that the angry customer has unjustly given him.

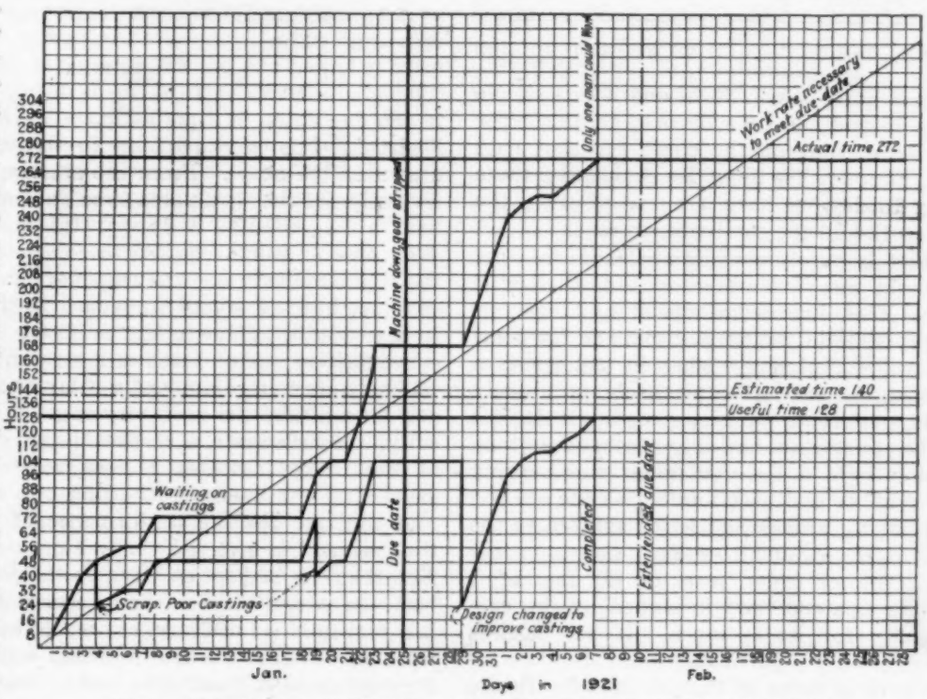


FIG. 1—CHART FOR SHOWING THE PROGRESS OF WORK ON A JOB

There is no need for such trouble and instead of the shop having to hunt new customers all the time due to the loss of old ones every time a settlement is made, old customers should be made firm friends and return every time they have work to be done.

It is the purpose of this article to point out a way by which this desirable state of affairs may be brought about and the customer be kept in constant touch with the state of his account and know from day to day just what his changes and alterations are costing him. All of this can be accomplished with little trouble and with very small expense and it will be in such form that the results can be seen at a glance. This system would also hold in any court of law in case a dishonest customer wished to avoid payment. All shops have some sort of a time-keeping and inspecting system even if it is only the workman himself who passes on the work which he is doing. This is the basis on which my system is founded. From these two simple facts can be evolved the system which I am about to describe with the aid of the chart in Fig. 1.

Each job is given a distinguishing number and the detailed parts of the job have the same number with some sort of a distinguishing suffix, such as No. 1000-1

or No. 1000-2; all work done on that order number is charged against the customer whose job it is. The bookkeeper or other clerk whose duty it is to make up the time on the various jobs is provided with some plain quadrille ruled paper of letter size which may be punched so that it can be kept in a loose leaf binder. He is informed as to the estimated time required to do the job and on the left-hand margin of the sheet he makes a scale of hours which represents "time worked" on the job. This scale should be in units of a working day or multiples thereof. It should be so arranged that the estimated time line will be about one-half the height of the sheet to provide for possible excess of time. If eight hours constitutes a working day each of the horizontal lines may be made to represent 8, 16, 24 or more hours. In the bottom left-hand corner the date of starting the job is placed and each of the vertical lines is dated including Sundays and holidays. We now have the basis

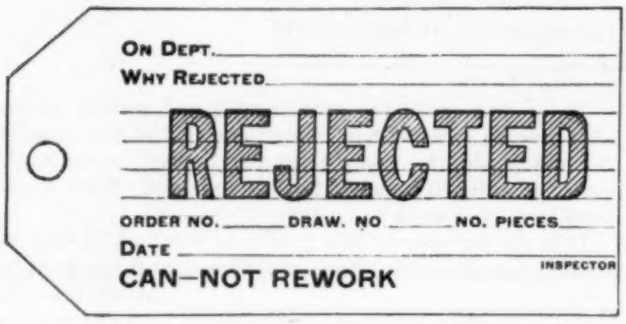


FIG. 2—REJECTION TAG ATTACHED TO SPOILED PIECES

of a chart which is quite conventional and it is a simple matter each day to add the time devoted to any order number and make a point on the chart for that date representing the time for the day. By connecting these points from day to day we have a curve showing the progress of the work and the total time to date.

So far the chart is purely conventional and does not add anything to the knowledge already had, all that it does is to make that knowledge visual and easy of access. Work proceeds in the normal manner for some time but one day the customer rushes in and wants a certain part changed, and if a mechanic is already working on that particular part, the customer decides whether it can be changed or not. The mechanic is then given a new job card of a distinguishing color bearing the same order number and part number as the old one but in addition having a dash and letter suffixed to the numbers as No. 1,000-1-A, and he starts to work on this new job order. The job order bears on the face of it the reason for its existence and is signed by the customer as authority for its issuance. If any useless work has been done on the particular piece the time required for this work is noted on the job card for future reference.

Suppose instead of being able to utilize the part already made or in process it has to be entirely thrown away and a new part made. In this case the procedure is exactly the same as before except that the new job order carries a letter, dash and the order number as No. A-1000-1. A third case may arise where the mechanic spoils a piece of work and the charge is clearly against the shop rather than against the customer. In this case the order number would be made with a dash following the part number and the man's number or initials as No. 1000-1-JD, the JD standing for John Doe. In this way the responsibility is placed where it belongs. No matter what the cause of the "set-back" may be, it appears on the chart. We now have three possible sources of added expense as against the customer or the shop, any one of which is readily distinguishable on the time tickets when they are received by the clerk for charting. In handling the first case where a piece is re-worked the job ticket will show on its face the number of hours of useless work on the original part and this amount is set off on the chart on the proper date as a line drawn vertically from the time curve and subtracted from it. In the second case, where the piece can not be re-worked, the original job card and time tickets are consulted to determine the amount of time expended on the particular piece and this amount is deducted from the time curve as in the first case. The third case is handled in a similar manner.

Against each of these set-backs a concise explanation of the reason thereof is written on the chart so that a glance will reveal the cause of any set-back which may be under duscussion at a later date. The job cards are, of course, filed and bear much fuller explanation of the causes of additional work having to be done.

Charting the Time Element on a Job

If the chart fulfilled no other purpose than that outlined above it would well justify its existence but this is only the beginning of the useful things which it accomplishes. Frequently the time element for the delivery of a job is important and the chart can be made to serve an extremely useful purpose in this case. When a due date is given on a job the chart in Fig. 1 is dated in the usual manner and on the date when the job should be completed a heavy vertical line is drawn to call attention to the due date. A time estimate having been given a horizontal line corresponding to this time estimate is drawn on the chart. From the starting date to the intersection of the "estimated time line" and the "due date line" a diagonal line is drawn; this line represents the daily flow of work required to complete the job within the estimated time and the manager can see from day to day just how he stands in regard to the delivery date. In case of a delay due to any cause the actual work time curve flattens out or becomes a straight line, informing the manager immediately of a delay or stoppage of work and he can take the necessary steps to correct the difficulty. In such cases, a bracket drawn over the flat part of the curve indicates a note written on the chart explaining the cause of the delay.

A contract for the performance of work where the time element is involved, really hinges on the number of men that can be kept at work on the job and this is the basis on which the contractor makes his estimate and his guarantee of delivery. It would be well for him to have his contract worded in such a way as to cover this assumption as it would save him serious trouble in many cases where he fails to deliver on the date contracted for. If he had covered himself by making a contract of this kind, he could claim extension of time for every change order by the contractor as well as for delays beyond his control which are ordinarily covered in contracts, all of which are shown on this chart.

From the foregoing it will be seen that the chart serves a very useful purpose and fills a want that has never been satisfactorily met to the writer's knowledge by any system in use in a small shop.

The use of this chart is by no means confined to the small shop but will be found extremely useful in any

shop where diversified production goes on. The writer devised it for use in a shop where the work was entirely experimental and where an accurate record was wanted of the work done on each job. One clerk, a girl, took care of an average of 700 jobs in process at the same time and kept all the charts for them besides doing considerable other office work.

In this shop, a very rigid system of inspection was kept and work was inspected in process as well as after finishing. In case of a piece failing to pass inspection, a rejection tag was attached to the piece. Fig. 2 shows the form of the tag and the data which it contains. Besides the rejection tag the form illustrated in Fig. 3, was filled out by the inspector in triplicate, and was signed by him and the foreman of the department where the fault originated. One copy of this form was held by the inspection department, one by the foreman of the department at fault and one copy was sent to the factory manager. This system placed the blame for all changes or faulty work squarely where it belonged and no possible way of dodging the responsibility could be found; it was also easy to trace the responsibility to the individual workman and so influence his efficiency record.

I found this chart a perfectly satisfactory method of production control and it made my work as works manager very much easier. I was not interested in the jobs which were progressing smoothly and never saw the charts on them, but when a delay occurred or there was a decided "set-back" for some reason or other, the clerk laid the chart on my desk about 10 a.m. and thus called the trouble to my attention. The chart showed the cause of the trouble so that I could at once take the necessary steps to remedy the conditions.

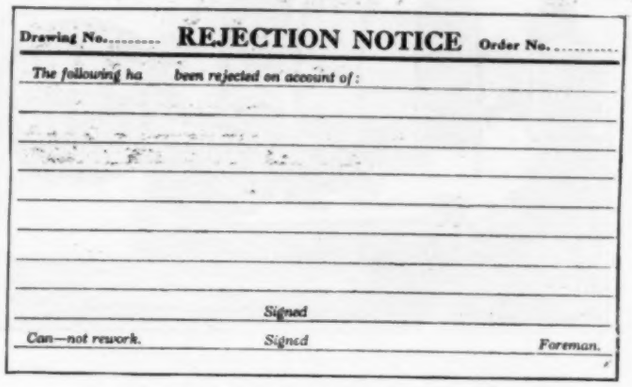
Special Order Forms

Perhaps it is needless to say that when a rejection tag was put on a job, work was immediately stopped on that order number and a new order number was issued bearing the proper dash letter or symbol so that the workman's time would start on the new order. These new order numbers were received from the factory planning department by phone and were followed by the proper form as soon as it could be made out, thus no delay was caused. Each of the special order forms covering the three cases previously mentioned were printed on a card of a distinguishing color so that as they came back the color of the form called attention to its character and the clerk knew just what procedure to follow in handling it.

It is useless to explain in much detail the system in use in any factory or shop; the fundamentals of a system can only be given as the details must be worked out to fit the conditions found in a given place. I believe, however, that any superintendent will find that he can adapt this chart to his own needs and find that he has a system by which he can keep himself informed of the progress of any particular job with the least possible expenditure of time and energy. It can readily be adapted to tool-room or experimental work and its utility for controlling production in these departments is obvious. The superintendent will find that he has here all the data necessary for keeping track of the individual jobs which are going through these departments.

When installing this system, some educational work with the foremen and personnel will be necessary. The foreman will come to regard it very highly because of the fact that it places all responsibility where it belongs and there is no possibility of evading it or "passing the buck." Any case where the responsibility for error is in dispute must be settled at once because when a foreman signs a rejection slip he accepts the full responsibility for that error.

In handling experimental work the chart serves still another purpose and makes it possible to estimate the time required to build a given machine or part after the experimental changes are eliminated. As all such changes have been noted on the chart as set-backs, the final time curve will show the actual amount of time taken to do the job, in other words the real cost for the experimental job and also the lower time curve which may be called the "useful time curve" or the time taken to do the work with the experimental work eliminated. From this latter curve we have a good foundation on which to estimate the time that will be required to do the job a second time. Any job shop can build up a very useful file of such information because the jobs which they get can be grouped and classified in such a way that nearly all new work will naturally fall into one of these groups. When a similar job comes in a chart can be selected which will be very helpful in estimating on the new job. Since most work will bear a resemblance to some previous jobs, the new work can be estimated more rapidly than if no guide were at hand.


Drawing No..... **REJECTION NOTICE** Order No.....

The following ha been rejected on account of:

Signed

Can—not rework. Signed Foreman.

FIG. 3—INSPECTOR'S REJECTION NOTICE

As the charts are used from day to day new and unsuspected uses will be found for them. They also constitute a permanent record which may be invaluable in many cases that might arise. When the President of the company calls you into his office and wants to know "why" about a certain job, put the chart on his desk and you don't have to talk at all, all of his questions are answered right there, the reasons for delays and changes and so on are explained in a manner that he can see at a glance. Try it.

American Valve Grinders in Denmark

Valve grinders are used but little in Denmark, repair shops not being so advanced in the use of modern equipment as in the United States, according to *Commerce Reports*, published by the Department of Commerce. Dealers are frank enough to admit, however, that the rapid increase in number of cars in use will make necessary the development of repair shops along more efficient lines, thereby offering a very good opportunity to introduce valve grinders for more general use.

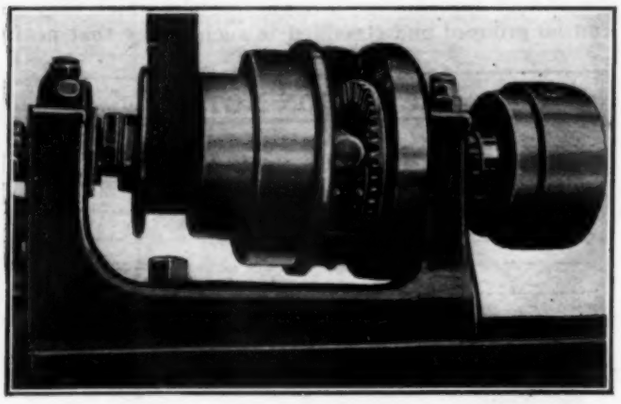
Those now in use are said to be largely of American manufacture and to be satisfactory. There should be a good market in this line with little competition from foreign manufacturers.

A Problem in Epicyclic Gearing—Discussion

By T. Humpage

I WAS interested in reading the article on page 283, Vol. 58, of the *American Machinist*, entitled "A Problem in Epicyclic Gearing." As I am the inventor and patentee of this particular form of gearing, I thought that a few personal details would be of interest to the readers of the above-mentioned paper.

In the year 1885, I had a small plain lathe on which I made various things at home as a hobby, and I frequently wanted back-gearing to slow down the speeds for turning various metals. The idea then occurred to me to fit some sort of gear inside the cone pulley of



THE FIRST EPICYCLIC-GEARED HEADSTOCK

the headstock. After careful thought I decided not to alter my small lathe, but to make a new 6-in. screw-cutting lathe complete with this epicyclic-geared headstock, which I finished in 1886. This lathe headstock is shown in the accompanying illustration and is still in regular use in our toolroom.

Applications of the Epicyclic Gear

Realizing that there were possibilities for its usefulness, I took out a British patent, No. 15,289 in 1887 for it, and in this same year I received a letter from the Yale & Towne Manufacturing Co., Stamford, Conn., offering to take up its manufacture in America. I was young, inexperienced and suspicious at that time, and to my great regret I never replied to their letter. Since then, however, I believe they have made thousands of their triplex lifting pulley blocks, and we are pleased to state that the best and most efficient lifting gear in our works is one of these. The principle of the gearing in these blocks is exactly the same as shown in my patent specification, with the addition of a clever device for sustaining the load automatically in any position, while being raised or lowered.

Many sets of this gear of both bevel and spur gearing types have been made for lathes, drilling machines and electric motors. A working model of the gear mechanism was by request placed among the exhibits of the machinery department of the South Kensington Museum, in London.

With but a small alteration of the numbers of teeth in the wheels an extremely wide range of reduction can be made. The chief point to bear in mind when designing these epicyclic gears, is to have the fewest number of teeth inter-changing with each other in a given time for the required ratio of reduction. The teeth of the gears should be generated, and the pressure angle of the involutes should in every case be not less than 20 deg. so that the teeth are not undercut but the involute curves are carried to the root of each tooth, thereby insuring quiet running. The highest efficiency under full-load which I have ever obtained has been 97 per cent.

National Economic League Favors Employee Representation in Management

As the result of a study of over 1,000 plans for improved relations between employers and employees, a special committee of the National Economic League on "Readjustment in Industrial Relations" recommends that employees should be given participation in management under certain limitations, and that they should be given the opportunity to acquire some financial interest in the establishments in which they work. The committee concludes that the term "industrial democracy" is misleading and should be abandoned; that employees, as a whole, are not interested in assuming the responsibilities of management; and that, while they should be given the opportunity to have a voice in management on matters affecting their immediate welfare, it would be inadvisable to have them participate in management on questions of policy, such as selling, purchasing, finance, and similar matters. An important point made by the report is that employees and executives should be given more instruction in the economics of business, as a step to better industrial relations.

The sub-committee which prepared the report is made up of the following: Daniel Bloomfield (secretary) lawyer and consultant in industrial relations; Charles W. Elliot, President-Emeritus of Harvard University; Edward A. Filene, President of William Filene's Sons Co.; F. P. Cox, General Manager, General Electric Co., Lynn, Mass.; James M. Head, former mayor of Nashville, Tenn.; Frederick A. Cleveland of Boston University; George E. MacIlwain of the Babson organization; John Calder, former Industrial Relations Manager, Swift & Co.; and J. P. Snow, a prominent Boston engineer.

Growth of Representation Movement

A vote was taken three years ago by the National Council of the League on the question, "Should there be active participation by employees or representatives of employees in all problems of management affecting the worker?" and the answer was an affirmative one by 78 per cent of the 500 members who voted. The present report aimed to learn what was done in this direction up to the present time, and the committee has made an intensive study of the experience with this question throughout the country.

The committee finds that the movement for representation of employees in the discussion and adjustment of working conditions is spreading rapidly, and that, in the majority of cases where such plans have been tried, they have been successful in establishing better relations. With few exceptions the plans in operation give employees advisory powers only, and that, says the committee, seems to be the most practicable method of representation at present. Actual responsibility for management cannot well be put on employees.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

BY HUGO F. PUSEP
The National Cash Register Co., Dayton, Ohio

This article won the second prize of $100

A METHOD of manufacturing a certain article which has been followed over many years may not be the most economical one now. The reason for this undoubtedly is the fact that machine tools of today are vastly more productive than their predecessors. This productiveness is chiefly the result of specialization in the design of modern machine tools.

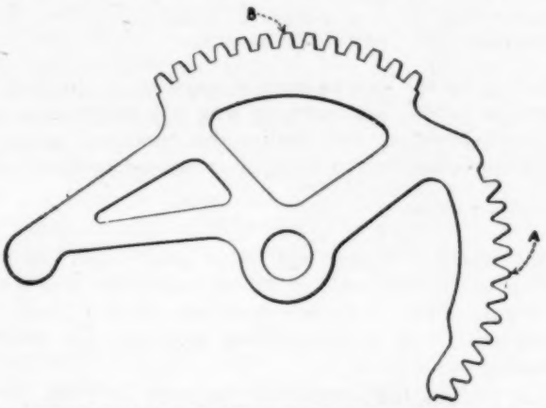


FIG. 1—FEED SEGMENT, ON WHICH THE COST OF CUTTING TEETH HAS BEEN REDUCED ONE-HALF

The National Cash Register Co., of Dayton, Ohio, has a big department where all the gears and segments for its registers are cut. There are thousands of gear segments of all kinds and sizes used on registers of different types manufactured by this company.

The teeth were always cut on plain gear cutters, it being out of the question to hob them. The segments, one of which is shown in Fig. 1, are steel punchings, 0.093 in. thick. Formerly they were mounted on an arbor holding from 30 to 40 blanks and the teeth *A* were cut. Then the teeth *B* were machined in the same way on another machine. As the two sets of teeth have to be in correct relation, it was necessary to locate accurately from a finished tooth of group *A* for the second operation. The gear cutters used were the company's own machines, known as the N. C. R. gear cutters, having been in use a number of years. Once the machine was set and started it needed no further attention until the stack of segments on the arbor was completed, the indexing being automatic. These gear cutting machines, when first built, were the last word in gear cutting efficiency.

A little less than a year ago it was decided to install a Fellows gear shaper for the segment cutting work. Consequently a high speed gear shaper was purchased. It is a machine admirably adapted to this class of work, and proved very conclusively that the old gear cutting equipment for the segments should be replaced by the gear shaper. Not very long after installing the first gear shaper another machine was ordered. At the present time the company has four high-speed special Fellows gear shapers installed, and practically all of the segment cutting is done on them.

Two types of gear shaper arbors, designed for quick loading and unloading, are shown in Figs. 2 and 3. The throw-off pins stop the machine at the completion of the cut. Fig. 2 shows ten blanks mounted on the arbor, and Fig. 3 shows two. In the second case the number is limited to two on account of the hub on the segment. One operator takes care of two machines and he is kept busy loading and unloading the arbors.

By replacing the old gear cutting machines with these modern high speed Fellows gear shapers the cost of production on all segments has been in most instances decreased by one half; in many cases it is even greater.

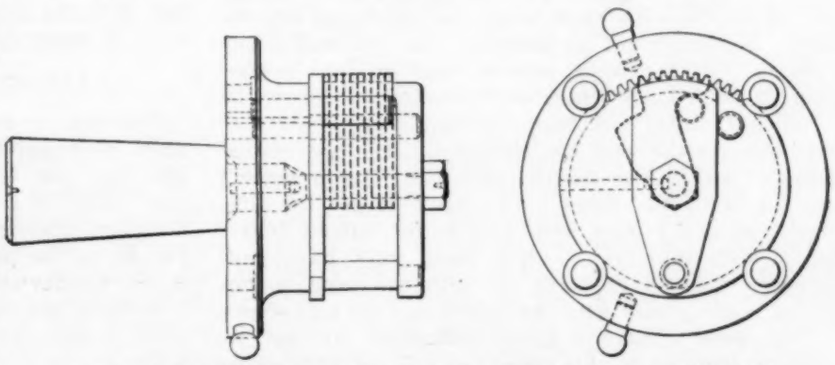


FIG. 2—FEED SEGMENT, MOUNTED IN LOTS OF 10 ON ARBOR, FOR CUTTING TEETH IN FELLOWS GEAR SHAPER

For example, it cost 84c. per 100 to produce the segment shown in Fig. 3 by the old equipment. Now it costs but 66c. per 100. The production cost of the feed segments shown in Fig. 2 has been decreased from 35 to 19c. per hundred.

The segment shown in Fig. 1 is a marvelous example of the efficiency of the new equipment. When cutting

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipment with new equipment. The article that won third prize will be printed next week.

the two sets of teeth, *A* and *B*, with the old equipment, the cost was 69c. per 100 pieces, whereas the gear shaper turns these segments out at a total cost of 31c. per 100—a saving of more than one-half over the old equipment. This great saving is made possible by the fact that the gear shaper cutter, which generates the teeth in this segment, has two sets of teeth on its periphery, so that teeth *A* and *B* are finished in one setting. Both sets of teeth, although of different shapes, are of the same number to an inch of circumference, thus making the foregoing method of cutting possible. These segments are used in cash registers, of one type only, at the rate of 6,000 per month. But this segment is of comparatively small usage. Bearing this fact in mind and remembering that the National Cash Register Co. makes over 200 types of registers and that the monthly output has reached to over 14,000 registers, it can be seen very clearly what a tremendous saving of money it has meant to replace the old gear-cutting equipment with the modern high-speed gear shaper.

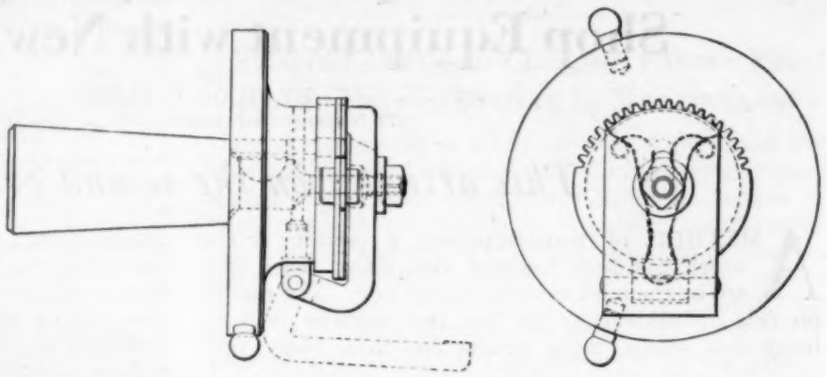


FIG. 3—RESET SEGMENT, MOUNTED IN PAIRS ON ARBOR, FOR CUTTING TEETH IN FELLOWS GEAR SHAPER

Here is a story that should be studied by every efficiency engineer and shop executive. Instead of worrying over the high cost of material and labor, why not set to thinking of improved methods and up-to-date machines which will reduce the production costs and thus more than counteract the increase in material and labor bills?

The manufacturer who delays in equipping his shop with modern machines and sticks to his old "stand-bys" is paying for the new equipment anyway, in the form of increased production costs, so why not install the most efficient equipment and realize the resulting saving in production costs in the form of increased profits?

Johnson Posts Brown About Wages

By John R. Godfrey

SAY, Godfrey, do you remember how you chuckled when Jim was giving me hail Columbia about letting that flapper go because I was too dern mean to pay her decent wages? Thought it was a good joke, didn't you?" said old man Johnson the other day.

"Well, you ought to have heard me jolt old man Brown when he told me his wage troubles the other day. 'Can't get any good men to go into the foundry,' he told me, 'and it's hard to get enough to go into the shop. Men ain't got no ambition like you and I had, Johnson. Rather work outside than go into a good shop. I don't know where we're coming at,' he wailed.

"Then I waded into him, Godfrey, sort of got even with him for the way Jim tanned my hide last spring. 'Brown,' sez I, 'the trouble with you is, you haven't kept up with the times. You can't forget the time when you and I were dern glad to get fifteen dollars for a sixty-hour week. But them days have gone forever. Instead of being up with the band wagon, you're trailing back with the clowns and the side shows.

"'It doesn't make a hoot's difference whether we think 50 cents an hour is aplenty or not—or whether we think a sixty-hour week is O.K. They ain't a wearing 'em that way this season.

Trolley Car or Machine Shop?

"'Of course I think a man who'd rather work on a trolley car than in a machine shop has a screw loose somewhere. But unless a man has a love for the shop that will offset 20 cents an hour, and a wife and kids who love to live on two meals a day, he's a chump to work for you for 50 cents an hour when he can get 70 on the trolley. It may not be as good a job but a lot of men get a heap of fun out of being out where they see people, where they can boss even a trolley car, and occasionally help a nice-looking girl hist her suitcase aboard.

"'It isn't a high ambition to want to work in the street gang, but it isn't any worse than the foundry; he's out in the open and he gets more money and works shorter hours. And when it comes to bricklaying—well the bootlegger is the only one who has anything on him. They're even having short courses of six weeks or so, to train a man so he can pull down from 12 to 16 dollars per. Of course it's highway robbery, but so is the price we pay for sugar and shoes and a heap of other things.

Upward Revision of Ideas on Wages

"'Brown, my boy,' I told him, 'we've got to revise our ideas of wages upwards. There may be a lot of 'em too high, but why make the shop man the goat? I don't know of a single trade where a man has to have the same training and skill as a good machinist and yet he is the poorest-paid worker of the bunch. Is it any wonder they are getting to be scarce?

"'We've got to realize that we're in competition with other trades, as never before, and if we want men, we've got to pay the going rate, no matter if you and I did work for fifteen a week years ago.'"

The old man was tickled with himself at lambasting Brown for the same thing Jim got after him about a while ago. And it may help him to let the unpalatable truth sink into his own consciousness. With the coming of the bigger plants much of the personal contact is gone and men weigh jobs more for the dollar and cents side than when they called the boss by his first name, which makes shop management today a bigger job than ever before.

Machining Steel Cylinder Sleeves of the Wright Aviation Engine

BY FRED H. COLVIN
Editor, *American Machinist*

Conclusion of second article—Cutting flanges which make the cylinders interlocking—Fixtures and tools for boring valve openings and seats—Final grinding and lapping

THE SLEEVE flanges of cylinders Nos. 2 and 4 are cut with a milling cutter on a radial drilling machine using the tool shown in Fig. 20. The threaded bushing *A* is screwed into the cylinder block in place of sleeve No. 1 and the hardened bushing in the center guides the pilot of the cutter *B* which mills out the front side of the flange of sleeve No. 2, previously screwed firmly into place. This operation is repeated with the same bushing screwed into cylinder No. 3 and sleeves Nos. 2 and 4 in position. Here the cutter mills out the opposite side of the flange on sleeve No. 2 and one side of the flange on sleeve No. 4. The cuts are gaged by the simple-limit gage shown in Fig. 21.

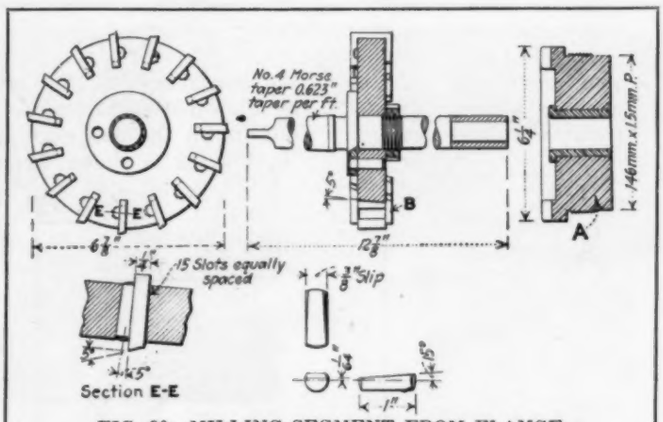


FIG. 20—MILLING SEGMENT FROM FLANGE

Sequence of Operations

Heat treatment	Grind solid end of sleeve
Brinell test	Assemble in block
Rough turn flange	Cut segments from flange
Rough bore	Bore valve seat holes
Face back of flange	Finish mill top of block
Rough turn outside	Finish grind flanges
Finish bore	Lap top of block
Finish turn outside	Grind bore of sleeve
Cut thread on outside	Inspection

The cylinder block, with all the sleeves screwed into place is put, sleeves up, in the fixture shown in Fig. 22, which is mounted on an 8-spindle Foote-Burt drilling machine. The first procedure is to put the drilling block, Fig. 23, into one of the sleeves. The body of the block is a sliding fit in the sleeve where it is clamped by the hook bolts as shown. The block guides the 2-in. drills used in the roughing operation and is moved from sleeve to sleeve. The valve holes are afterward finish bored with the tool shown in Fig. 24. An extension piece is fitted to the Morse-taper shank and the whole thing driven by a chuck in the spindle of the machine already referred to. The pilot on the end is guided by the guides *A* in Fig. 22. In Fig. 25 is shown the gage used in setting the cutter in the boring tool in Fig. 24. The pilot fits the small hole in the gage and centers it around the cutter. The opening at *A* enables the cutting point to be plainly seen when setting it.

The valves are seated after the valve guides are screwed into the aluminum cylinder-block. No fixture is required as the valve-seating cutter is guided by the guides used in boring the seat holes. A final cut of about 0.01 in. is taken through the valve hole, using the flexible boring bar shown in Fig. 26, using the valve guide as a bushing for the pilot on the end of the boring bar. This operation lines up the valve hole with the valve guide, which is an important point. The valve seats are then cut with 90-deg. (Included angle) seating cutters, slipped on the bar shown in Fig. 26, which is also used in connection with the flexible driving arrangement.

The assembled block then goes to the Becker milling machine shown in Fig. 27 and the upper surface is finish milled with a very light cut. The cylinder block goes next to the Pratt & Whitney vertical grinding machine, as shown in Fig. 28, where the sleeve flanges are faced off to the correct dimensions.

In Fig. 29 is shown the final lapping of the upper end of the cylinder block on the large lapping plate, while Fig. 30 gives an idea of the method used in handling the block while boring the end-shaft drive hole and similar operations. It will be noted that the flanges of the sleeves are carefully supported on steel blocks and that the jig *A*, which guides the boring bar at the upper end has a long bearing on the cylinder block. The boring bar is also piloted at the lower end.

Two of the inspection operations are shown in Figs. 31 and 32. In Fig. 31 the inspector is testing the accuracy of the valve-guide holes with relation to the upper face of the cylinder block which carries the cam shaft. These holes must be at 90 deg. to the cylinder block within a tolerance of 4 min. or $\frac{1}{15}$ of a deg. The small, square surface plate shown has a hole

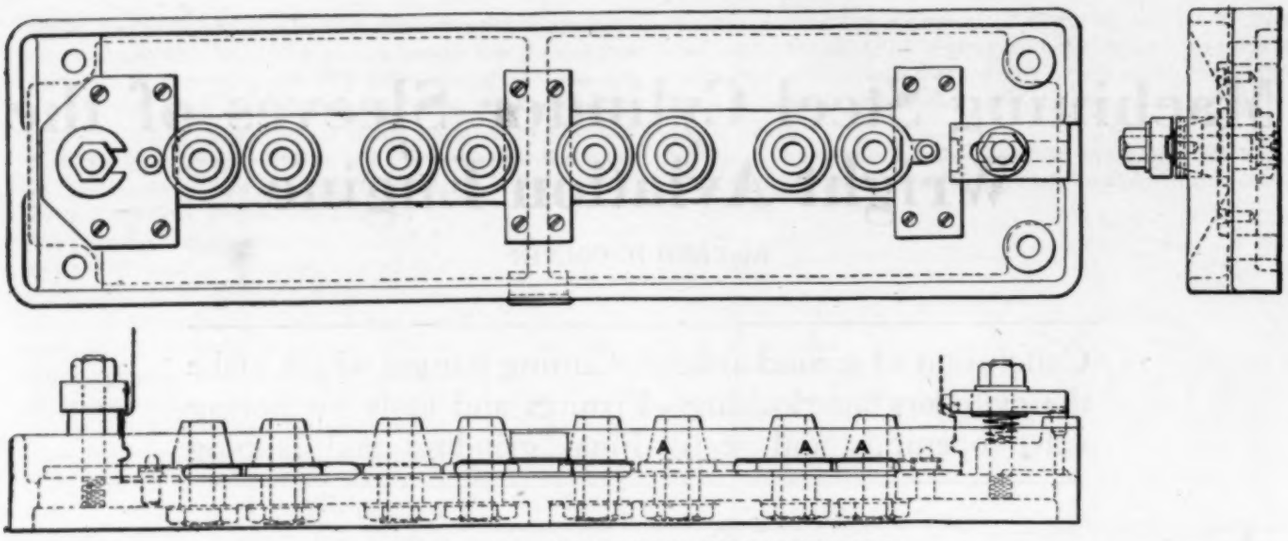


FIG. 22—FIXTURE FOR DRILLING VALVE HOLES

through which is inserted a plug gage that fits the valve-guide hole. This plug gage has a dial indicator attached to it which, when rotated, shows the variation from squareness of the plug with the surface plate. The allowable variation of 4 min. is equivalent to about 0.003 in. on the dial gage.

In Fig. 32 is shown finish grinding the bore of the sleeves on a Heald hydraulic cylinder-grinding machine. This is one of the few cases where cylinders are ground wet, the reason being that the sleeves are of steel instead of cast iron as generally used in cylinder blocks.

A visual inspection of the final grinding of the bore is shown in Fig. 33. The dial gage used in testing the diameter of the bore is shown on top of the second cylinder block.

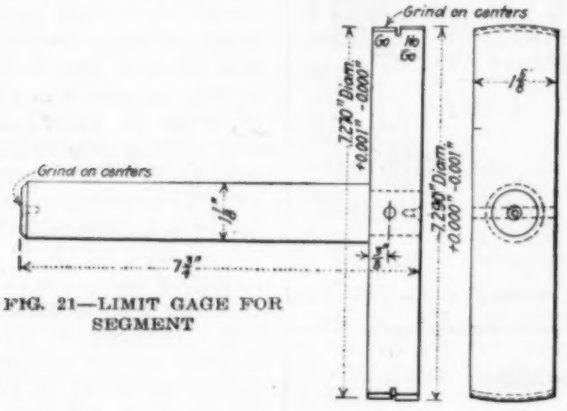


FIG. 21—LIMIT GAGE FOR SEGMENT

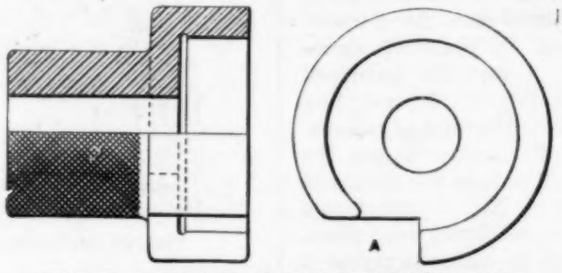


FIG. 25—GAGE FOR SETTING BORING TOOL

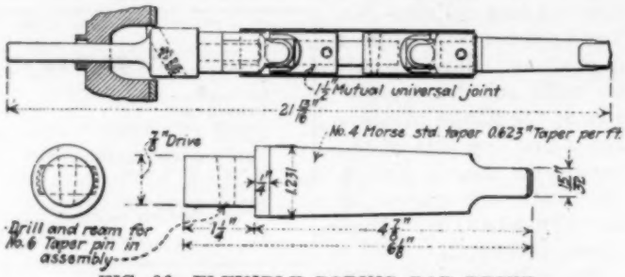


FIG. 26—FLEXIBLE BORING BAR DRIVE

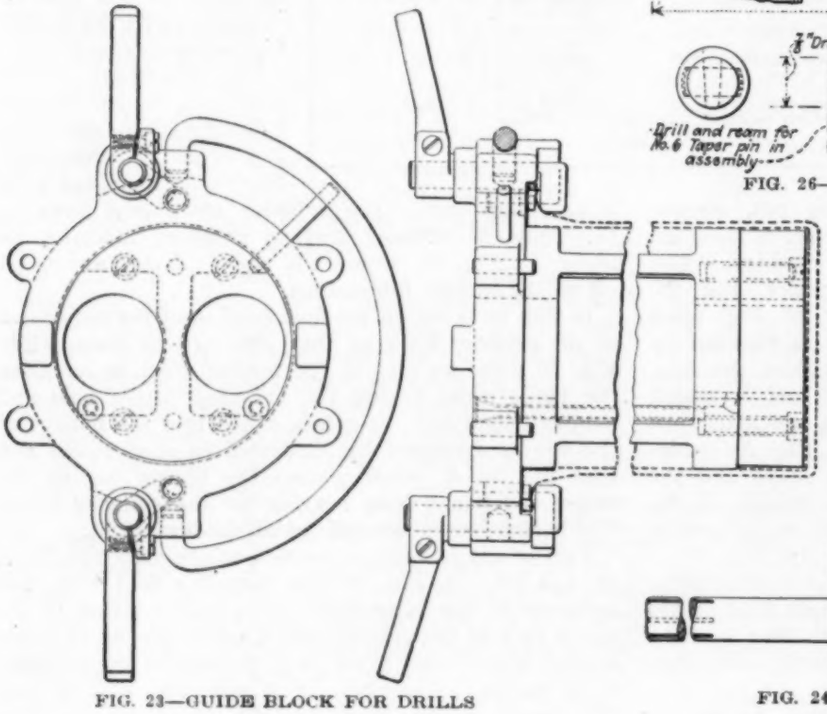


FIG. 23—GUIDE BLOCK FOR DRILLS

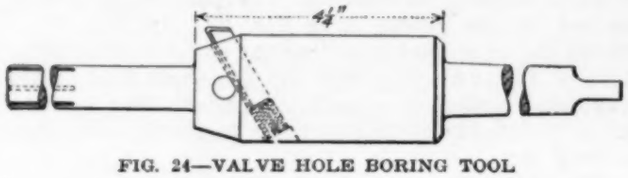
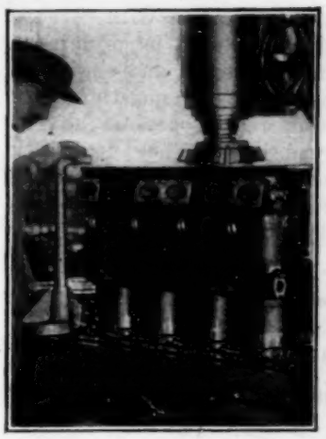
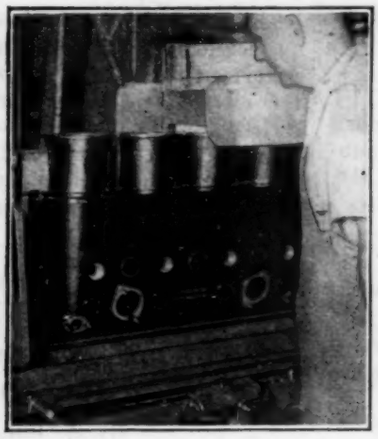


FIG. 24—VALVE HOLE BORING TOOL





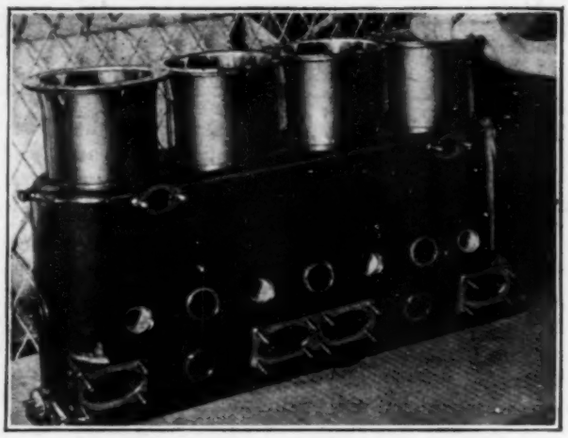
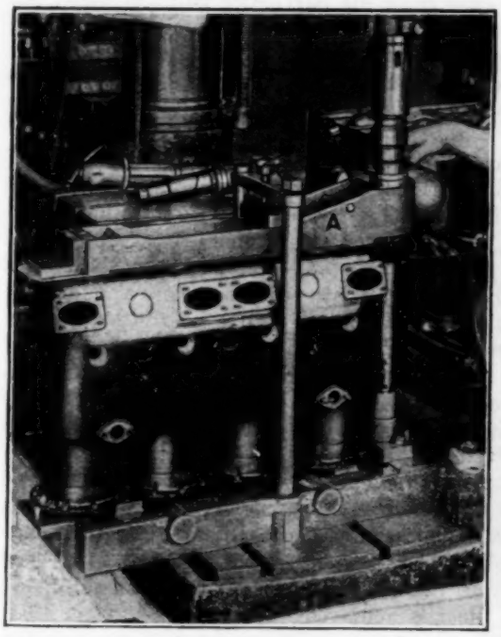


FIG. 27—FINISH MILLING CYLINDER BLOCK. FIG. 28—FINISH GRINDING FLANGES
FIG. 29—LAPPING TOP OF CYLINDER BLOCK



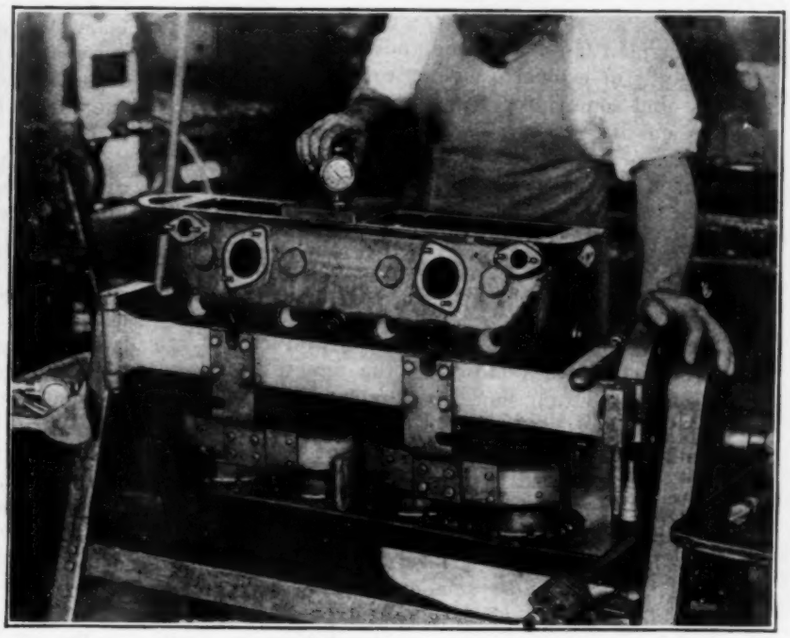
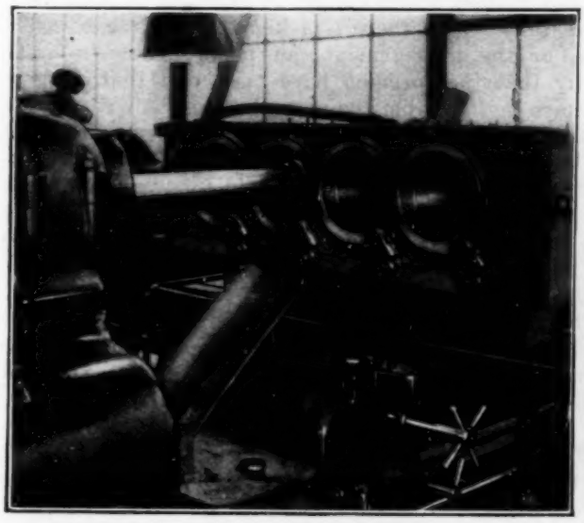


FIG. 30—BORING HOLES FOR CAMSHAFT DRIVE. FIG. 31—TESTING ALIGNMENT OF VALVE GUIDE HOLES



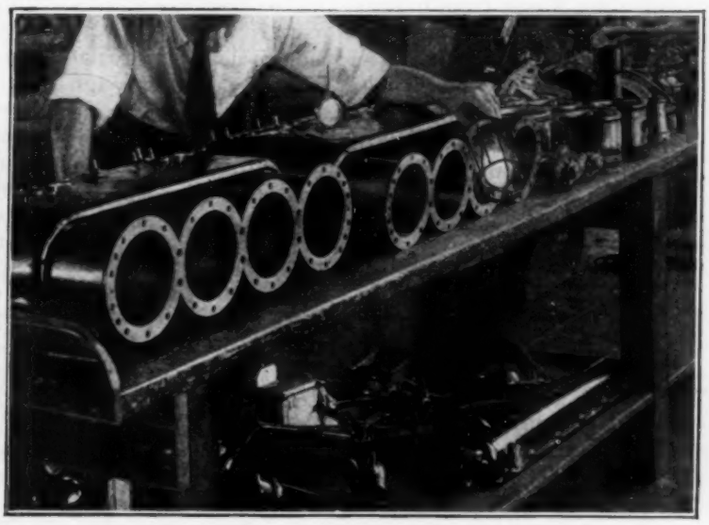


FIG. 32—GRINDING BORE OF SLEEVE. FIG. 33—INSPECTING BORE OF SLEEVES

Book Reviews

The Exclusive Agency. Prepared by the New York University Bureau of Business Research and published by New York University, New York City. Paper binding, 64 pages, 8½x11 in. Price $1.

Much of the material upon which this study in the marketing of manufactured products is based, was secured by questionnaires and interviews. These were furnished by both manufacturers' representatives and retailers and the book is of real value to one interested in these matters, since it represents the opinion of some of the most efficient business men in this country.

A general description of exclusive agency methods as used in marketing manufactured products is followed by the questionnaire and the tabulated returns. Comments from many executives who filled out the questionnaires are interjected throughout the book and are quite conclusive as to conditions under which the exclusive selling plan is desirable or undesirable.

The details of exclusive agency contracts are treated carefully and some interesting points are brought out, among them being a statement of the manufacturer's attitude on price-cutting.

Among the most interesting features of this book is the discussion of the advantages and disadvantages of the exclusive agency system. The study of these points is made both from the standpoint of the manufacturer and that of the dealer and gives a comprehensive insight into the general aspects of the exclusive agency system. Among the advantages to the manufacturer are noted the active sales effort of the agent, the closer control of distribution, more reasonable competition and lower unit selling expense. To the jobber and the retailer come such advantages as greater prestige, assured business, concentrated selling effort and purchasing power, and removal of unfair competition.

The evils of the system, from the manufacturer's viewpoint, consist of dependence on the agent and loss of competition stimulus, smaller returns from advertising, and promotion of substitutes by other dealers. The dealer faces such obstacles as dependence on manufacturer's sales policy and chance of loss of agency, lower margin of profit, hindrance to desirable price reductions, losses from overstocking or shortage of supply and "knocking" by competitors.

Considerable effort has been made to determine what kinds or classes of product are best marketed through exclusive agents. The common practice in arranging terms of agency agreements is stated, and a number of representative contracts are printed in full in the appendix. The practical value of the book is increased by the addition of these contracts.

Locomotive Catechism. By Robert Grimshaw. Nine hundred forty-six pages, 5x8 in., cloth boards, 468 illustrations. Thirtieth revised and enlarged edition. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York City. Price $4.

This book, well known everywhere to firemen, engineers, trainmen, switchmen, shop hands and roundhouse men, has been brought up to date in the thirtieth edition. Especial attention has been paid to the unaflow engine, the improved superheater, the latest design of power brake, and the electric locomotive.

There are 4,000 examination questions with correct answers, including official questions used by prominent American railways in examining firemen and engineers for employment and promotion. The questions are strictly practical and for that reason possess a very definite value for the railroad man. They deal with the design, construction, running and repair of all kinds of locomotives. Every man working with locomotives can add materially to his knowledge and efficiency by studying Mr. Grimshaw's book.

The Foreman and the Suggestion Box—Discussion

BY W. ROLAND NEEDHAM
Goodmayes, England.

Frederick A. Pope, writing upon the above subject on page 572, Vol. 58, of *American Machinist*, makes out an excellent case from his particular point of view, but I am strongly of the opinion that no one point of view, however broad, can be entirely comprehensive. Much depends upon the mentality of the men themselves, of the foremen, and of those responsible to the management.

In one firm with which I have been intimately acquainted, suggestions are expressly solicited. Those offering their ideas do so quite openly, giving name and department. Approved suggestions are accepted and paid for in cash, and in addition the successful ones are specially mentioned in the company's quarterly periodical, together with the nature of the suggestion and the amount of the award. A pleasing feature of the system is that when an idea is turned down a reasoned statement is supplied. If an idea, as distinct from its immediate application, promises well, due credit is given for it.

In brief, the management welcomes suggestions and takes pains to let the fact be known. There is thus a healthy rivalry between the departments, and the heads of departments and foremen enter into the spirit and play the game fairly. Where such conditions prevail, Mr. Pope's ideal is achieved.

Where, however, the management is keen for improvement and the foremen prove the stumbling block, two main alternatives offer: there is the sealed suggestion box system, which cannot be expected to work very successfully where there is a big inertia drag to overcome, or the management can make it known quite plainly that the foremen have been told that suggestions are invited from the operatives in their respective departments, that it is up to them to encourage their men and that progress shown will be adjudged a department success. When the individual foreman once realizes that his co-operation and support can help his men to make good, not only will the team work improve but he will know something of the scoutmaster's pride in the success of his troop.

There is the case, however, where not only is the foreman apathetic if not entirely in opposition, but the management itself is indifferent. In such a state of affairs, unless the whole thing is allowed to fizzle out, the closed suggestion box seems to be the most practicable method.

The question of mentality looms very large here, as almost everywhere. Once men's imaginations are fired, things begin to happen. A little sympathy will show them that they are kin. It is good business, too.

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The third article—The selection of grinding wheels—Effect of grain and grade—Wheel and work speeds—Relation of the various factors

IN NO other branch of our industry do the quantity and quality of work turned out depend upon so many factors, all of which are interdependent, as in production grinding. Factors to be considered are: the grain and grade of the wheel, the diameter and rotative speed of wheel, diameter and rotative speed of work, nature of material to be ground, nature of the abrasive with which it is to be ground, amount of stock to be removed, finish required, and last but by no means least the condition of the machine upon which the work is to be done. A material change in any one of these factors is sure to affect all the others.

The kind of abrasive to be used, whether silicon carbide or aluminous oxide, may fairly be determined by the nature of the material to be ground. This does not mean that certain materials cannot be ground with one abrasive and can be ground with the other, for, because of the close relationship of all factors concerned, we may compensate in some degree for the use of the wrong abrasive by altering other conditions to suit.

THERE is nothing mysterious about a grinding wheel, even though the art of grinding seems to be enveloped in a fog of mystery. Why, then, should a set of conditions under which excellent results are secured in one shop prove to be so unsatisfactory in another? Why does one expert operator reach a maximum production upon a given machine and piece of work, with a wheel that another operator, equally expert and capable of turning out equally good results, says is wholly unsuitable? The answer to these questions lies in the fact that successful grinding involves so many factors, all of which are interdependent, that it is difficult to determine when all of them are duplicated.

The principal difference in the physical characteristics of the two abrasives is that while silicon carbide is slightly harder than aluminous oxide it is also more brittle, and therefore it would logically follow that it should be used on materials that offer less resistance to the cutting action of the grains, leaving the tougher materials to the less easily broken aluminous oxide.

The Quality of Toughness

It is difficult to say just what constitutes this quality of toughness. It is not necessarily hardness, for the use of high-speed steels has taught us that hardness alone is not the quality that offers resistance in a cutting tool. High-speed steels are not as hard as carbon steels, yet they are more difficult to cut. Manganese steel is much softer to the scleroscope than hardened tool steel, yet a tool of the latter material will make no impression upon it.

The grinding wheel is no less a cutting tool than the steel tools used on lathes or planers and it is sensitive to the same conditions as govern the latter; therefore in deciding upon what kind of a wheel to use upon a given material we must look to something besides the actual hardness as the deciding factor.

In the present state of the grinding art it is difficult to say just what this quality is, but from many experiments conducted by well-known manufacturers of grinding wheels and machinery it has been found that the tensile strength of the material to be ground is the most accurate index of its power of resistance to the wheel, and this quality is the one commonly accepted to decide the question as to which kind of abrasive to use.

Among the materials for which the aluminous abrasives should be used are carbon, high-speed and the various alloy-steels, annealed malleable-iron, wrought iron, tough bronzes and tungsten. For grinding gray iron, chilled iron, brass, soft bronze, aluminum, copper and the softer materials generally, the silicon carbide abrasives will be found to give the best results. From the above-mentioned experiments, in which many wheels were thoroughly tried out upon various materials and under all conditions, it has been determined that materials having a tensile strength of above 50,000 lb. per sq.in. of section should be ground with the aluminous abrasives, while for those below 40,000 lb. the silicon carbide should be used. This leaves a rather wide debatable margin, and for materials the tensile strength of which falls within the uncertain range, only individual experiment can be relied upon to determine the selection.

The proper size of grain to use upon a given job depends upon many conditions, among which are relative hardness of material to be ground and quality of finish desired upon the work. In general it may be said that the less refined the work the coarser may be the grain of the wheel, yet this does not necessarily follow, as a very fine finish indeed may be secured with a coarse grained wheel if other conditions are right.

To gain a proper understanding of the action of the abrasive grains in service, let us consider a disk of steel having a single tooth, or cutter, inserted in the

periphery. If the disk be held stationary with the cutting point in contact with the work and the latter revolved against it, the point will curl a single continuous chip before it, and the thickness of the chip will be dependent upon the distance that the cutting point projects from the disk. If the disk is revolved rapidly and the work slowly the material of the latter will be cut away in a series of triangular chips, each beginning in a sharp point where the cutter enters and terminating in a blunt end as the cutter passes out of contact with the work.

The thickness of chip will be in proportion to several things; it will be less if the speed of the disk is relatively high and greater as the speed becomes slower; similarly, it will increase or decrease as the advance of the work becomes fast or slow. At a given rate of advance for both disk and work, the thickness of the chip at the blunt end will increase as the diameter of either or both disk and work become larger and will decrease as they diminish. In any case the thickness of the chip can never be more than the space between the work and the periphery of the disk will allow.

The Wheel as a Single-Tooth Circular Cutter

A grinding wheel is such a disk, not with a single tooth but with hundreds of thousands of teeth. The amount that these tools (grains) project from the periphery of the disk (chip clearance) is largely determined by the grain size. We may consider the thickness of the chip the tools can be made to cut to be dependent upon the strength of the tool, and this is determined by the nature of the abrasive. We can see that the thickness of the blunt end of the chip may be diminished by revolving the wheel faster, the work slower, or by lessening the diameter of the wheel or work.

Grain size is therefore affected by wheel speed, work speed, and by relative diameters of wheel and work. It is also affected by the condition of the machine upon which the work is done. A fine grained wheel may be used effectively at a high velocity and may not be at all satisfactory when driven at a slower rate of speed, for the reason that the number of chips removed in a given time would be greatly increased and the thickness of the individual chips thereby lessened. Finer grained wheels may be used when wheel and work diameters are small than when both are large. Finer grained wheels may be used at slow work-speeds than at fast ones. Finer grained wheels can be used on external cylindrical work than upon flat or internal work, and a fine grained wheel may be made to counteract to some extent the evils introduced by a faulty condition of the machine.

Fine grained wheels should be used upon soft materials that exhibit a tendency to cling to the surface of the wheel. This trouble is technically known as "loading," and while with some materials it cannot be entirely eliminated, changing from the wheel in use to one of finer grain may reduce it materially.

Combination wheels may be used very effectively upon work of such nature that it is desirable to take off a considerable amount of stock quickly and still leave a good finish. This is not infrequently the case when the work is so heavy as to make it inconvenient to pass it through two operations.

With a 24-60 grain wheel such work can be reduced almost to the required size and then by redressing the wheel with two or three passes of a blunt diamond, an excellent finish may be obtained. By the time the finishing cut has been completed, the wheel will be in condition to take the roughing cut off the next piece, after which it should be again redressed to do the finishing.

In selecting a wheel for a given job, the grade is a very important consideration as it affects more conditions and to a greater degree than any other factor. To say that a work piece of hard material requires a soft bonded wheel and *vice versa* is quite correct, but tells only a small part of the story. A relatively soft bonded wheel may become an apparently hard bonded one by merely increasing the surface speed at which it is running. The same condition may be brought about by changing from a work piece of small diameter to one of larger diameter and adjusting the number of revolutions per minute to maintain the same surface speed of work, or, with the same work piece, reducing its surface speed. Conversely, a hard bond automatically becomes a soft one as the wheel diminishes in diameter unless compensation is made therefor by increasing the rotative speed of the wheel spindle or the surface speed of the work.

Two wheels of the same grade-letter are not necessarily exactly alike in the matter of hardness, even though both are from the same maker. The operation of grading is entirely manual and much depends upon the skill and judgment of the grader. The grading tool is a cross between a screwdriver and a blunt hand-chisel, and the manner of using it is to force it into the wheel with a twisting motion, the resistance offered to the tool by the wheel being the grader's sole means of knowing how hard the wheel is.

The hardness of a wheel is, therefore, not an arbitrary standard. Its quality in this respect as designated by the grade letter indicated that it lies somewhere between the degrees of hardness represented by the preceding and following letters. Further, of two wheels having the same grade letter, one a silicate and the other a vitrified wheel, and presenting approximately the same degree of resistance to the grader's tool, the silicate wheel will appear to be the softer in action. The silicate wheel seems to be freer cutting and to generate less heat. This circumstance may be remembered to advantage in grinding thin or small work when trouble is experienced from undue heating.

Effect of Wheel and Work Speeds

From the foregoing it would seem that the speed at which a grinding wheel should be run is a factor not easy to establish arbitrarily. It has taken grinding machine makers and operators a long time to reach this conclusion and there is still much divergence of opinion, so much that some makers of grinding machinery so design their machines as to make no provision for changing the wheel speed, while others, by means of cones or change pulleys upon the spindle, make it comparatively easy to suit the wheel speed to the work in hand.

Though it is true that changes in work speed may be made to compensate for the reduction in wheel speed as the wheels becomes smaller in diameter from wear and redressing, such changes also bring about apparent changes in grade and it is not always expedient to make them. A designer of grinding machines has said many times to the writer, that "a change in work speed does not affect the rate of output." A change in work speed results immediately in an apparent change in grade of the wheel, and to slow the work speed without decreasing the output involves increase of arc of contact

and increases bearing pressures, which in turn react upon the wheel.

If all of our grinding machines were so rugged and all of our work so heavy that we could always gage the depth of cut to suit the rate of speed at which the wheel is running, the necessity for variable wheel speeds would disappear and we could make all compensations through the medium of the change gears of the work head; but, unfortunately, much of our work will not lend itself to this method of compensation and we are, therefore, often compelled to vary the wheel speed to suit other conditions.

Five thousand feet per minute was long ago established as the proper speed at which to drive a grinding wheel, but it is difficult today to get grinding machine operators to say just why this speed is correct and very easy to find such men advocating wheel speeds ranging from 3,500 to 7,000 ft. per min. for various classes of work. The best we can do is to consider the 5,000-ft. rate as the basis or point of departure from which to reckon the speed that will give us the best results and alter it as may be necessary to suit the work in hand.

The effect of a wheel that is running too fast is to burn or glaze the work, and to counteract it we must increase the work speed or reduce the depth of cut, or both. This burning or glazing is also the effect of a wheel that is too hard for the work, and it may in this case be corrected by changing to a softer wheel.

Wheel speed may, therefore be considered, within limitations, as a corrective factor to be applied for the purpose of making a hard bonded wheel act as a softer one or *vice versa*. It is the least proportionately effective of the variable factors, for it requires a change of approximately 1,000 ft. per min. to produce the same effect upon the work as would be caused by a change of one grade in the matter of wheel hardness.

Physical conditions limit the range of application sharply, for the reason that the bursting strain increases as the square of the velocity, and to run a wheel at a speed much faster than it is rated by its makers is to introduce a hazard that cannot be tolerated.

"Arc of contact" is a term applied to the actual length of the wheel's periphery in contact with the work and has no connection with "area of contact" which applies only to cup or cylindrical wheels that grind upon the face. It is a term directly related to "depth of cut" and has nothing to do with the width of the wheel.

Arc of Contact

Arc of contact is smallest upon round work when wheel and work are of minimum diameter, increasing as the diameter of either or both increases. Flat work may be regarded as of infinite diameter and the arc of contact increases or decreases directly with the diameter of the wheel. When the work is concave the condition has changed from external to internal grinding and the arc of contact becomes greater as the wheel increases or the work decreases in diameter.

Arc of contact affects the grain as well as the grade of the wheel, and the reason is not far to seek if we remember our experiment with the steel disk. Each particle of abrasive in the periphery of a grinding wheel in action is cutting a small triangular chip from the surface of the work and these chips are necessarily carried through the arc of contact before they can escape. Longer contact will clog the wheel more quickly and make it act as would a finer grained wheel upon the shorter arc.

The term "area of contact" is used only in connection with cup or cylindrical wheels, in which form the active grinding surface is the face of the wheel. Such wheels are used on several types of surface- and face-grinding machines whereon the area of contact may easily cover half the working face of the wheel. In this case, as in cylindrical grinding, the chips must be swept over the entire area before they can be expelled, and therefore the wheels used are much coarser in grain and softer in grade than the average of wheels used for cylindrical grinding.

In selecting wheels for this type of machine, the same conditions are observed in respect to the nature of the abrasive. The matter of grain and grade is determined by the superficial area of the work. If the piece is wide it will be necessary to use the coarser and softer wheels, while if it is narrow, harder bonds and finer grains may be selected.

A rough, uneven surface to be ground demands a wheel harder than the nature of the material would naturally require, for the reason that such a surface will wear away the wheel too rapidly. For such work it is advisable to make two operations and change to the wheel normal to the material as soon as the roughness has been reduced.

In surface-grinding machines of this type, provision is seldom made for changing the wheel or work speeds, and the area of contact is arbitrarily imposed by the size and shape of the work. Therefore the variable factors are limited to the characteristics of the wheel itself.

Tests of Bronze, Duralumin and Electron Metals

One of the papers presented at the 26th annual meeting of the American Society for Testing Materials, held at Atlantic City, June 25 to 29, 1923, dealt with the resistance of manganese bronze, duralumin and electron metals to alternating stresses. This paper is the result of an investigation made by the Engineering Division of the U. S. Army Air Service at McCook Field, Dayton, Ohio, to determine the endurance limit of duralumin bar stock as rolled, annealed and tempered. It also includes similar investigation on manganese bronze and electron metal. Tests were made on rotating steam machines of the same type as used in the fatigue investigation at the University of Illinois and on the same type of specimens.

The endurance limits of the metals tested are as follows:

Manganese Bronze	15,000	lb. per	sq.in.
Electron Metal	17,000	"	"
Duralumin "As Received"	14,000	"	"
Duralumin tempered at 925 deg. F.	12,000	"	"
Duralumin annealed at 700 deg. F.	10,860	"	"

It is believed that the endurance limit of non-ferrous metals can not be determined by applying 10,000,000 repetitions of stress, as is the case with most steels. This is borne out by tests in which failures have been obtained at 30, 50, 80 and 100 million repetitions. In some cases, it may be necessary to go as high as 200 to 400 million repetitions of stress, as was the case for duralumin.

The endurance limits of the non-ferrous metals tested, do not seem to bear any definite relation to other physical properties. Difficulties were also encountered in adapting types of machine and of specimens which were primarily designed for steel, to light aluminum alloys.

World Trade in Metal Working Machinery—Imports

Prepared by Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

United Kingdom, 1921

Supplement to table published on page 805, Vol. 57.

Countries	Quantity Tons	Value, £	Number of Pieces
Sweden	42	6,731	76
Germany	797	79,232	1,462
Netherlands	79	16,458	223
Belgium	7	1,421	4
Denmark	42	8,298	67
France	45	6,595	69
Switzerland	24	15,674	109
United States of America	1,761	460,283	2,089
British Possessions	2	1,054	4
Other Foreign Countries	201	36,459	723
Total	3,000	632,205	4,826

Value of £ at parity is $4.8665.

Argentine Republic, 1918-20

Imports of Lathes ("Tornos")

Supplement to table published on page 188, Vol. 58.

Country of Origin	1918 Kilos	1919 Kilos	1920 Kilos
Germany		843	49,795
Austria-Hungary (Austria only from 1920 on)			2,038
Belgium			30
Spain	,293	5,452	3,651
United States	45,826	68,884	212,470
France	117	52	7,303
Italy			87
Netherlands			639
United Kingdom	1,591	16,683	38,660
Sweden	30	151	3,662
Switzerland		943	
Denmark			5,831
Brazil			
Uruguay	105		
Chile			
Norway			
Japan		24	
Total of Imports	56,962	93,032	324,166

Philippine Islands, 1921

Supplement to table published on page 266, Vol. 58.

Country of Origin	Dollars
United States	213,848
United Kingdom	4,405
Hongkong	76
Belgium	
France	
Germany	2,352
Hawaii	
Total of Imports	220,681

Spain, 1920

Supplement to table published on page 82, Vol. 58.

Country of Origin	Kilograms	Peseta
Canary Islands		
Germany	497,351	805,709
Algiers		
Argentina		
Austria-Hungary		
Belgium	28,316	45,872
Denmark	771	1,249
United States	204,235	330,862
France	254,199	411,802
Great Britain	165,161	267,496
Holland	22,822	36,972
Italy	13,147	21,298
Morocco (Spanish)		
Norway	6,856	11,107
Portugal	117	189
Sweden	124,144	201,113
Switzerland	36,273	58,762
Other Countries		
Turkey	465	753
Totals	1,353,817	2,193,184

Par value of peseta is 19.5c.

Chile, 1921

Supplement to table published on page 1003, Vol. 57.

Country of Origin	Quantity Kilos	Value Pesos
Great Britain	56,988	77,166
Germany	22,534	25,839
United States	17,873	39,209
France	5,300	2,000
Belgium		
Argentine Republic		
Italy		
Total of Imports	102,695	144,214

Germany, 1921

Supplement to table published on page 840, Vol. 57.

Country	Quantity 100 kgs.	Value 1,000 Marks
Belgium		
Denmark		
France		
Great Britain		
Italy		
Netherlands	4,719	
Norway		
Austria (formerly Austria-Hungary)	1,660	
Sweden		
Switzerland	2,027	
U. S. of America	2,077	
Other countries	3,051	
Total	13,534	257,981

Total no. of pieces: 1,726

Denmark, 1921

Supplement to table published on page 924, Vol. 57.

Country or Region	100 Kilograms
Hamburg	
Germany	
Great Britain	801
Norway	107
Sweden	1,544
Holland	
Switzerland	
France	72
Austria-Hungary	
United States	212
Other or Unknown Countries	142
Russia	13,020
Total Quantity (100 kgs.)	15,898

Sweden, 1920

Supplement to table published on pages 876-7, Vol. 57.

Country	Kilograms	Kroner
Norway	2,267	2,140
Finland		
Russia	2,290,145	3,301,887
Denmark	125,096	225,217
Germany		
Netherlands		
Great Britain	36,267	170,144
France		
Switzerland		
Austria		
Belgium		
United States of America	486,958	2,115,312
Other Countries	94,459	312,047
Total	3,035,192	6,126,711

Par value of krone is 26.80c.

Japan, 1921

Supplement to table published on page 112, Vol. 58

Country	Piculs	Yen
Kwantung Province	41	5,000
Asiatic Russia	86	7,000
Great Britain	47,431	3,375,000
France	265	41,000
Germany	2,327	213,000
Belgium	157	12,000
Italy		
Switzerland	120	35,000
Holland	10	1,000
Sweden	639	71,000
United States	68,240	7,211,000
Total	119,317	10,971,000

1 picul = 133⅓ lb.
1 yen = 49.85c.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

XVIII. Good tools considered a paying investment —To save time first law of this shop—Gages and fixtures that are used—Miscellaneous service tools

BELIEVING that good service consists of two major features, speed and quality, the management of the Chicago branch of the Cadillac Motor Car Co. is continually developing special tools for specific operations. The special tool equipment of the Cadillac shop represents at the present time an investment of approximately $75,000.

A view of the tool room is shown in Fig. 1. The machines are all painted light gray, a background against which dirt and grease contrast strikingly, thus encouraging a tendency to keep the machinery clean. All belts are guarded to prevent accident and benches are provided for tools and parts so that everything can be kept off the floor. One of the most interesting tools in the shop is the camshaft grinding attachment shown in Fig. 2. It can be applied to a lathe or removed in a few minutes. The gear *A*, which is bored to the same size as a camshaft end bearing, is slipped over the end of the customer's camshaft and locked in place by means of a setscrew. The shaft is then swung between the centers of the lathe, the dog, which is attached to the gear, fitting into the slot in the faceplate as shown. The master camshaft *B* turns in bronze bushings in two brackets that are bolted to the bed of the machine. The gear *C* is keyed to the shaft, the train being completed by a small intermediate gear so that the two shafts move simultaneously and in the same direction.

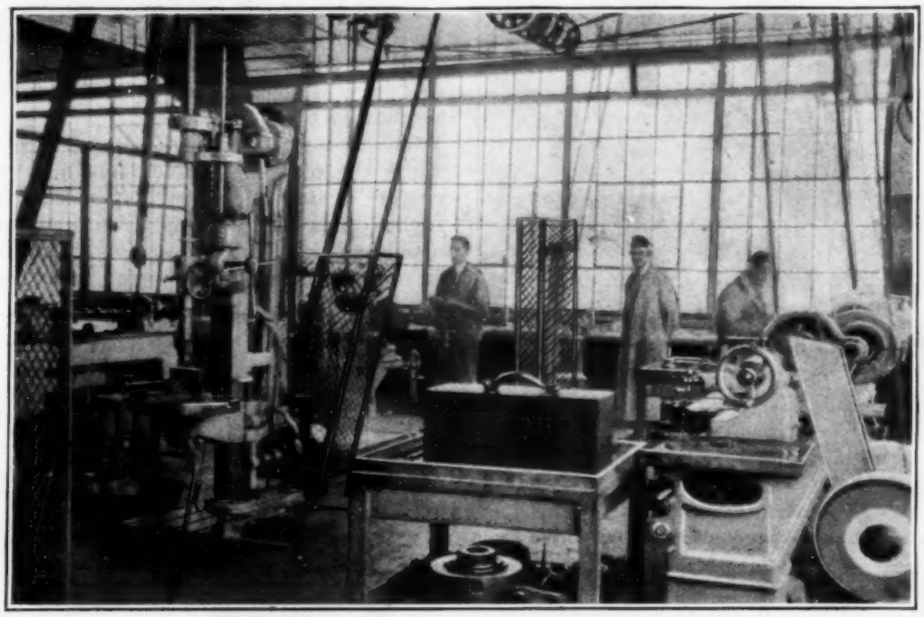


FIG. 1—TOOL ROOM, CADILLAC SERVICE STATION

The cross-slide of the machine is replaced with a slide that carries the master cam roller *D* and the small grinding wheel *E*, together with the motor by which it is driven. A weight attached to the cable *F* keeps the roller *D* in contact with the master cam, so that as the shafts revolve, the grinding wheel moves backward and forward with the master roller, thus grinding the cam on the customer's shaft to an exact duplicate of the master cam. The grinding wheel is a 3x¾ in., 36-P, Norton, and the motor is ⅛ hp., 3,400 r.p.m., made by the Bodine Electric Co., Chicago, Ill. The amount of stock removed is usually from 0.002 in. to 0.003 in. Ninety per cent of the worn camshafts that come into the shop are reclaimed with this tool. The time required is approximately two hours and the cost is only about 25 per cent of the cost of a new camshaft.

The tool shown in Fig. 3 is used for grinding the contact points on rocker arms, one of which can be seen in the machine at *A*. As there are two holes in the piece, it is located on two studs in the swivel arm *B*. The arm swings in a vertical plane on a shaft through the center, and the locating studs are so placed that the contact point on the rocker arm is just 4½ in. from the shaft. When the swivel arm is moved up and down, by means of the handle *C*, the contact point is ground on a 4½ in. radius. A wheel dresser *D* can be seen attached to a slide that is controlled by means of a small hand wheel. As the wheel wears down, the swivel arm is adjusted by loosening the cap screw by which the arm is attached to the bracket that supports it. The bracket can be adjusted to right or left.

FIG. 2—CAM GRINDING ATTACHMENT FOR LATHE

Valves can be both straightened and checked for straightness on the fixture shown in Fig. 4. The valve is suspended between centers as shown. Then arm *A* is allowed to rest on the valve stem. The valve is rotated, and if it is not straight, the arm *A* will move up and down with the bend in the valve and the small pointer *B* will indicate the amount of variation on the

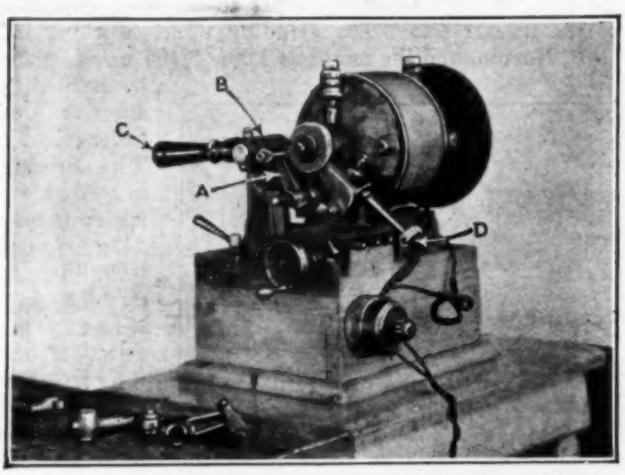


FIG. 3—MACHINE FOR GRINDING CONTACT POINTS ON ROCKER ARMS

vertical scale just back of it. The centers can be withdrawn, allowing the valve to drop into two Vs, and the arm *A* is then used as a straightening bar. The operations are repeated in that sequence until the valve stem is straight.

At the left of the valve head an indicator can be seen, which is adjustable so that it can be swung around to bring the finger in contact with the angle on the valve-

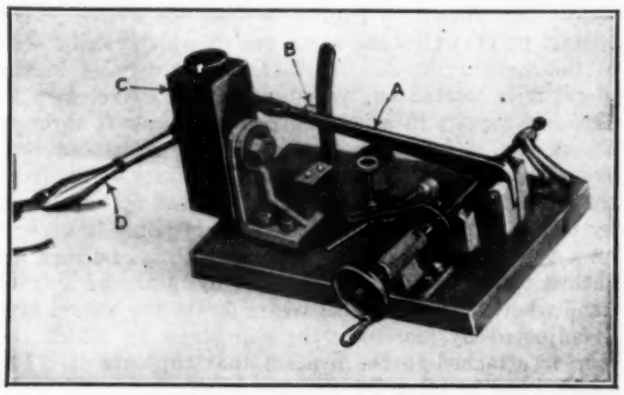


FIG. 4—TOOL FOR TESTING AND STRAIGHTENING VALVES

seat. This indicates whether or not the head is true with the valve-stem. If the head is not true, the valve is placed in the set of blocks *C*, bored with half of the hole in each block. The clearance and the proper angle for the valve seat are provided at the top end of the blocks as shown. The valve is placed in the hole between the blocks, with the head projecting a short distance from the top and the stem is clamped tightly by means of the handle *D*. Then the head is struck squarely and sufficiently hard to drive it down into the seat in the blocks. One blow is usually enough to straighten the head.

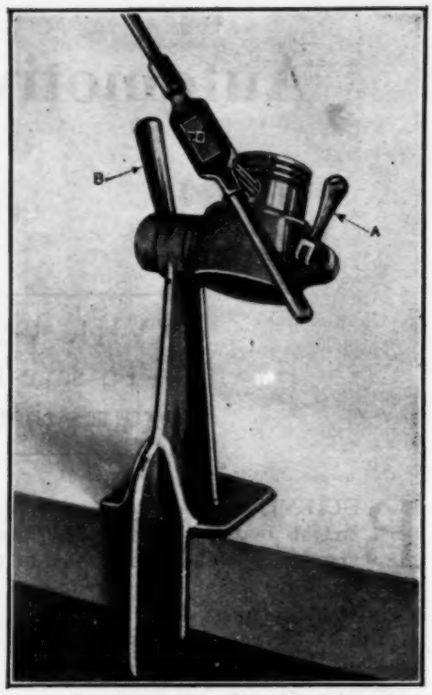


FIG. 5—PISTON-HOLDING FIXTURE

The fixture illustrated in Fig. 5 is for holding pistons while the piston pin hole is being reamed, as shown, or for holding pistons while the rods are assembled to them. It is made of cast iron, and can be clamped to a table or bench. Turning the handle *A* closes the split in the ring in which the piston is held so that the piston

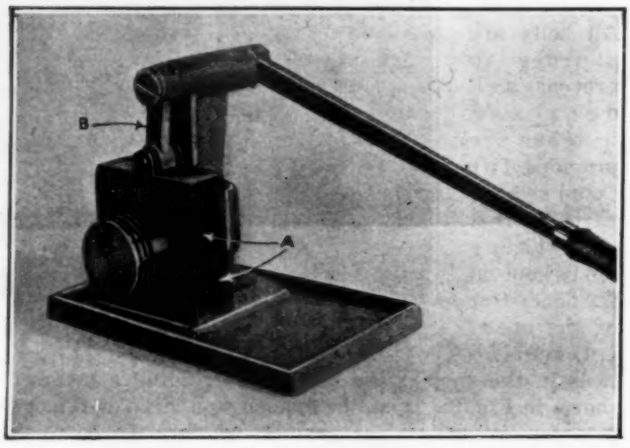


FIG. 6—PISTON STRAIGHTENING TOOL

is held firmly without scratching or distorting it. The handle *B* screws onto a stud that is a part of the ring and which projects through a hole in the bracket. By loosening the handle *B*, the piston can be turned to any angle in a vertical plane.

Every mechanic knows that a piston may be ground ever so carefully, yet it will be slightly heavier through the bosses than through the sides where the thin walls have no support. Consequently most pistons have to be straightened after they are ground. The tool indicated in Fig. 6 straightens them easily and quickly. The

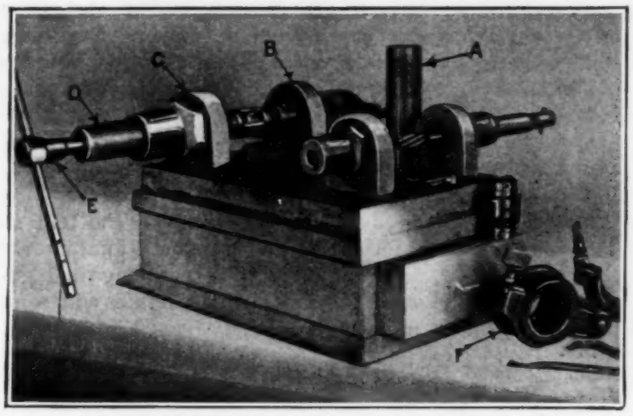


FIG. 7—CONNECTING ROD REAMING FIXTURE

two cold rolled steel blocks *A* are bored out to the diameter of a piston, as shown, then about ⅛ in. is milled off the faces of the blocks where they come together, to provide necessary clearance. The hole is relieved also, so that about 1¼ in. of surface is left to contact with the upper and lower sides of the piston.

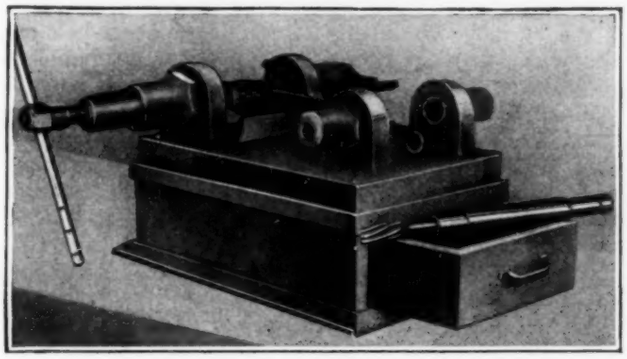


FIG. 8—SHOWING CONNECTING ROD IN PLACE

Dowel pins insure proper alignment of the blocks. The upper block is attached to the arm *B*, which is suspended from an eccentric shaft. Raising the lever turns the shaft and raises the upper block approximately ¼ in. Any desired amount of pressure can be applied with this tool and a piston can be quickly straightened.

An excellent tool for reaming connecting rods or crank case main bearings is shown in Fig. 7. A pilot sleeve, similar to the one shown at *A*, is inserted into the bracket *B* and a small clamp is attached by means of a setscrew to the outer end of the sleeve. To this clamp is attached a small steel cable that carries a weight, the cable being swung over a pulley in such a manner that the weight tends to pull the sleeve in toward the center of the fixture. The outside diameter of the sleeve is such that the sleeve is a sliding fit in the connecting rod bearing before the bearing is reamed. A hole through the axis of the sleeve is also a sliding fit for the pilot on the end of the reamer.

The bracket *C* is bored slightly larger than the reamer, so that the reamer can be inserted without injury to the blades. The sleeve *D* is a sliding fit in the bracket and also on the shank of the reamer. This sleeve can be removed from the reamer-shank when necessary by knocking out the taper pin *E* and removing the piece that carries the handle. The connecting rod that is to be reamed is placed in position as shown in Fig. 8, with the sleeve entering from one side and the reamer from the other. This keeps the bearing in alignment while the reamer is

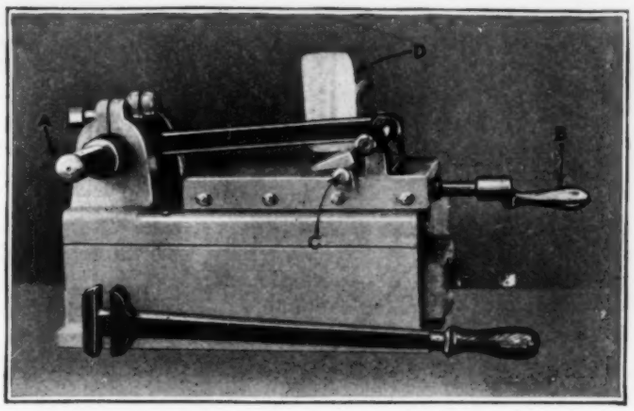


FIG. 9—CONNECTING ROD STRAIGHTENING FIXTURE

entering, and as it proceeds into the hole, it pushes the sleeve out on the opposite side.

The clamp *F*, Fig. 7, will hold a main bearing that is to be reamed before assembling. The clamp is made in two halves, hinged together, a swinging screw and thumb nut being provided to lock the clamp around the bearing. The convenience of this fixture is self-evident.

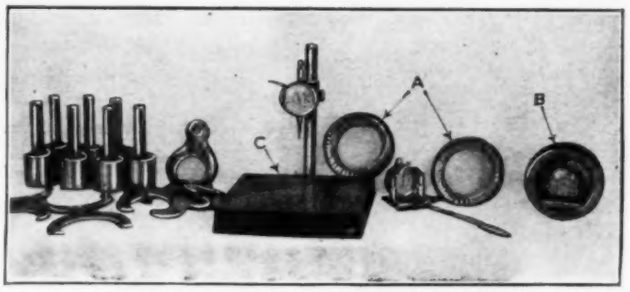


FIG. 10—SOME TIME-SAVING GAGES

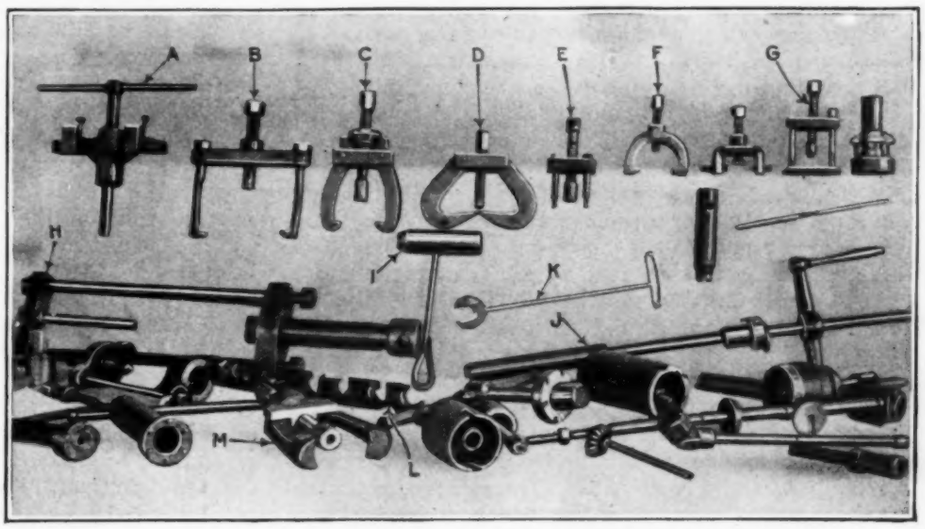


FIG. 11—MISCELLANEOUS SERVICE TOOLS

A fixture for testing and straightening connecting rods is shown in Fig. 9. The large end of the rod is held in place by the hardened and ground plug *A*, and a straight pin is placed through the small end of the rod. This pin is also hardened and ground to a size that makes it a push fit in the piston pin hole. The ends of the pin rest on the ground and polished surfaces of two blocks of equal height, and if there is any twist in the rod, one end of the pin will be raised accordingly. Operation of the handle *B* feeds the slide on which the blocks are located in so that the pin will be brought into contact with the surfaces on the back sides of the blocks, and the rod can be inspected for bend. If the rod has to be straightened, the knurled head of the screw *C* is turned, bringing a rest up under the rod so that the small end of the rod will be raised clear of the blocks. Then the bar shown resting at the side of the fixture is used to straighten the rod as desired. Provision is made for taking up any wear in the brackets in the head end of the fixture, as shown, and the polished surface plate *D* can be lowered into horizontal position so that the piston and rod can be tested for straightness after assembling.

Time-Saving Gages

The two hardened and ground steel rings shown at *A*, Fig. 10, are master gages for over-size piston rings. When a cylinder is bored over-size, it is bored to a standard dimension, which is the same as that to which the rings are ground. Thus by using the rings, a mechanic can file the piston rings to the correct size without having to be running back and forth to try them in the cylinder. The ring *B* is a master for cylinder bores. By trying the cylinder bore indicator in this ring and then in the cylinder, any variation from the correct size can be instantly noticed. The surface plate *C*, to which the dial indicator is attached, is used for testing piston rings for thickness, or for testing anything else where an indicator of this kind can be used.

The set of snap gages shown at the left of the illustration is used for checking crankshaft throws. There are five of these gages and they are graduated downward by degrees from standard, which is 1.375 in. When a shaft is 0.005 in. smaller than standard, it is returned or discarded. For each snap gage a corresponding plug gage is made which is 0.002 in. larger than the snap gage, to allow for clearance, and the crankshaft bearings are reamed to fit these plugs. The plugs and gages are numbered, each corresponding plug and snap gage bearing the same number.

A miscellaneous collection of tools is shown in Fig. 11, many of which will be familiar to every repair man. The tool shown at *A* is for reaming connecting rods before the bearings are assembled. The clamps shown on either side hold the rod and fixture solidly together while the reaming operation is being performed. The tool *B* is for pulling off cam gears. Another kind of cam-gear puller is shown at *C*, the advantage in this kind of tool being that as the bolt is screwed in, the round piece with the taper turned on it forces the legs of the puller together, thus giving a better hold on the gear. The tool *D* is a fan puller, the operation of which is obvious. The tool *E* is a plug puller and the tool *F* is a steering arm puller. The tool *G* is for removing generator couplings. The large tool *H* is used to remove spindle bolts from front axles. The puller is placed in position with the large screw, which is hollow, over the head of the bolt. In the opposite end of the puller is a stud, the upper end of which engages the lower end of the bolt. As the screw is turned, the stud is pulled upward, forcing the bolt up into the hollow screw, from which it is afterward removed.

It is sometimes necessary, when working on a rear axle that has been removed from a car, to drive the torsion rod bolts. The tool *I* is used to protect the thread when this is necessary. The end of the tool, on which a taper has been turned, is placed against the end of the bolt and the driving is done against the opposite end of the tool, so that no pounding will come on the thread of the bolt.

Applying Oil Retaining Washers

It occasionally happens that new felt washers have to be put into the rear axle, which is usually a several hours' job. A matter of approximately two hours can be saved by using the tool shown at *J* for this operation. The axle shaft is removed from the rear axle and the cover is removed from the differential gear carrier. Then the shaft of the tool indicated is inserted through the axle until the end projects into the gear box. By reaching down into the gear box now, one can place the felt washers over the end of the shaft. Then the tool *K* is inserted through the cover-hole and the horseshoe-shaped piece on the end of the handle is slipped into the recess in the end of the shaft so as to prevent the washers from slipping off. Turning the large handle on the threaded end of the shaft pulls the shaft outward and pulls the felt washers into place. Once in the required position, the tool *K* is removed, the shaft is withdrawn, and the job is done. Without this tool, the whole rear end has to be torn apart.

The piece *L* is a tool that is used to lift all the valves at once, so that work can be done without removing them. The edges of the recesses shown are machined down so that they can be easily slipped under the heads of the valves; then the whole thing is raised by turning the screws shown. The tool *M* is a puller for the spiral gear on the crank shaft.

(Conclusion of this article will be published next week)

Swedish Labor Unrest Reflected in Reduced Iron Output

The labor unrest which has obtained in Sweden since the beginning of the year is reflected in the greatly reduced output of the iron industry, Assistant Trade Commissioner H. Sorenson reports to the Department of Commerce. The entire pig iron production in Sweden for the first three months of 1923 amounted to only 37,300 metric tons as against 57,400 tons for the corresponding period of 1922, and 186,100 tons for 1914, according to the report just published by the Swedish Iron Works Association.

As a result of the general lock-out situation, there has been considerable drop in the number of furnaces in operation. Of 132 blast furnaces only 18 were active, of 204 Lancashire furnaces but 29 were working, none of the 18 Bessemer furnaces produced, 2 of the 82 Martin furnaces were in blast and 3 of the 27 electric steel furnaces were operating. Exports during the quarter have, however, improved, the total quantity of all kinds of iron and steel shipped during that period amounting to 48,600 tons as compared with 37,400 tons for the first quarter of 1922. The increase was due solely to pig iron, of which 22,600 tons were exported.

Modern Methods of Thread Measurement

By CHARLES L. BURNS
Production Research Engineer, Wright Aeronautical Corporation

A comparison of ring gages — The three-wire and projection methods—Defects of the former and economy of the latter

HOW OFTEN when we hear an inspector of threaded parts say, "Rejected because of loose fit to gage," or, "Alter because too tight to gage," do we stop to inquire whether or not his means of inspection are trustworthy? We learned, during our workshop days, to judge the various fits by the "feel" of the shaft in the hole, and so accustomed have we become to this method of judging, that the words "fit" and "feel" are considered by us almost as synonymous. But it shows a lack of analysis of the factors essential to the perfect mating of two threaded parts, not to discriminate between "feel" and "fit" where screw threads are concerned. This has such an important bearing on the choice of thread gaging methods that I shall endeavor to make an analysis of these factors before considering the relative merits of several gaging methods.

In each of two mating screws there are five things that have to be correct if a perfect fit is to be obtained. These are the major diameter, pitch diameter, minor diameter, pitch or thread, and angle of thread, all of which are illustrated in Fig. 1.

An ordinary screw and nut used in the assembly of mechanical equipment is chiefly intended to resist end pressure, and therefore must possess sufficient mechanical strength to do this. If we examine closely two tight fitting threads, we will see that the tightness is made up of a combination of inaccuracies rather than by close fitting and a little thought will show that it is possible to have a tight fit between a screw which is hopelessly undersize and a nut which would pass inspection. Fig. 2 shows such a case where, through having a progressive pitch error in the screw, it is possible to get a tight fit, even though the major diam-

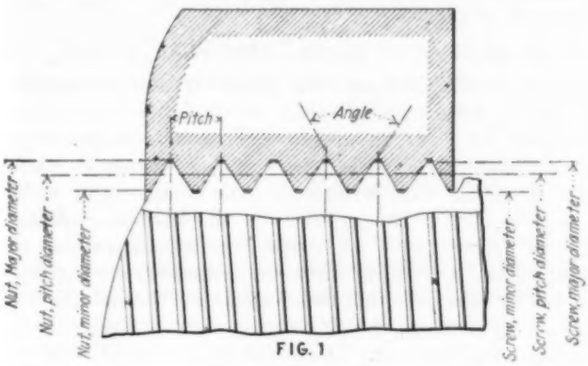


FIG. 1

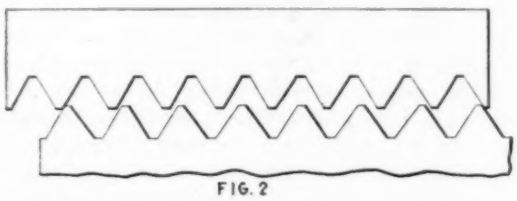


FIG. 2

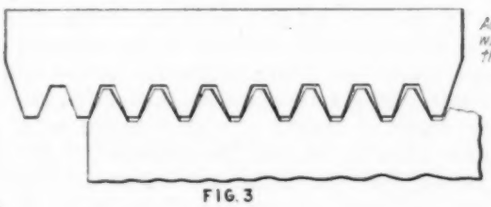


FIG. 3

FIG. 4

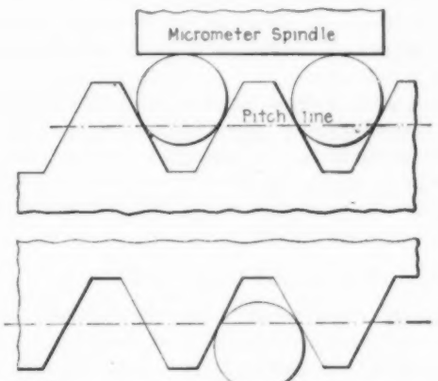


FIG. 5

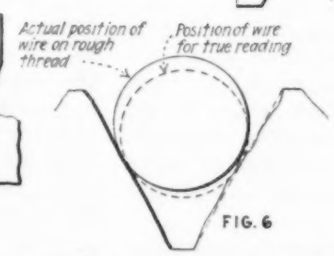


FIG. 6

FIG. 1—THREAD ELEMENTS TO BE MEASURED. FIG. 2—EFFECT OF PROGRESSIVE PITCH ERROR. FIG. 3—EFFECT OF ERROR IN ANGLE. FIG. 4—EFFECT OF PITCH DIAMETER. FIG. 5—THE THREE-WIRE METHOD FIG. 6—ROUGH THREADS AFFECT MEASUREMENT

eter of the screw is very little larger than the minor diameter of the nut.

Such a screw would have no strength. The tightness is only secured by a deformation of the end threads, and the tighter the parts are screwed together the greater this deformation. A similar possibility is shown in Fig. 3, where an error in the angle of the thread on the screw will produce a tight fit but will give no flank contact between the mating parts and therefore little mechanical strength. These two examples, Figs. 2 and 3, should be sufficient to dispose of the general idea that "tightness" or "feel" are indicative of strength or quality of fit.

The really vital elements in screws are:

1. Pitch—the most variable of all elements and the most difficult to control, for as long as screws are made on machines with moving parts, errors will creep in, due to the clearances necessary to allow the machine to operate.
2. Angles of flank—a feature possible of control within fine limits.
3. Flatness of flank—also easy to control.
4. Pitch diameter—the plain diametral dimension which is the measurement of strength. (See Fig. 4.) The major and minor diameters are relatively unimportant, except in so far as it is important to provide such a clearance as will insure against interference between the mating parts at the crest and root.

We must accustom ourselves to thinking of qualities of screw fits as qualities of flank contact. Flank contact, as we have seen, is principally governed by the accuracy with which we make the pitch of threads and the pitch diameter. So this gives us two things—the pitch and the pitch diameter—which must be watched most carefully in thread gaging. The system we use must check these if it is to be efficient and reliable. The ideal gage, of course, will check all elements in a thread.

The most widely used methods of gaging screws are: By ring thread-gages. By three-wire system, and by projection apparatus. I proposed to consider each of these methods in the light of the previous discussion and see how far each comes up to the requirements for an efficient gaging system.

Ring Gages Least Efficient

Ring gages are probably the most widely used and yet in heir usual combination of full form, "go" and "no go,' they are perhaps the least efficient. They rely solely on the "feel of tightness" for their authority to accept or reject a screw. And we have seen from Fig. 2 and 3 how faulty the conclusions drawn from such a method of test may be. Such gages would accept the screws previously shown. All that is necessary to make ring gages accept too tight a screw, is to thin down the threads or reduce the pitch diameter of the screw.

For a system of ring gages to be trustworthy, no less than four separate gagings of each piece are necessary. It would require "go" and "no go" gages for the major diameter to insure that diameter is not so large as to cause interference with the crest of the thread in the nut, nor so small that the effective depth of engagement between the mating threads will be reduced below the prearranged minimum. To make sure that the minor and pitch diameters are not above the maximum, it will require a GO gage of maximum full form. To detect a pitch diameter which is smaller than the minimum, a gage which will check only that element is necessary. Such a system would be both cumbersome and expensive.

The three-wire system is one that is used very extensively in the checking of pitch diameters of thread gages. Several measuring machines have been developed around the idea of inserting accurately ground and lapped wires in the thread grooves, as in Fig. 5, and measuring over the tops of the wires with a micrometer. Though this method attacks the question at a very important point—the pitch diameter—it is only a partial check. Additional gaging or measuring has to be resorted to for the major and minor diameters, and some sort of lead testing device (which generally is an expensive and delicate instrument) has to be provided to check that most variable element, the pitch of the thread.

Even with this additional equipment, the three-wire system is beset with possibilities of error. For a true conversion of dimension over the three wires into pitch diameter, the wires should rest on the flanks of the threads at the pitch diameter line. With rough threads, this condition may not be secured because one or more of the wires may rest on rough peaks, as in Fig. 6, and false readings will be the result. Very often, also, the trailing flank of the threads will be slightly concave and again a false calculation of pitch diameter will result, this time due to the dropping of the wires into the concave surfaces.

Further Drawbacks to Three-Wire System

Disagreements between the inspector and the workman, due to difference of touch on the micrometer, are more likely to occur in measurements over wires than in almost any other cases where a micrometer is used, on account of the ease with which the small round wires can be forced into the grooves of the threads. Apart from the possibilities of error, the disadvantage of awkwardness in making three-wire measurements has to be taken into account, not forgetting the calculation necessary to convert the dimension over the wires into pitch-diameter reading. It is true that this calculation should be made in the drafting room or given in the form of a conversion table but the work has to be done and involves the possibility of error in the process.

An ideal gaging system should check all the five elements in a thread and this is what the thread comparator does by projection. Throwing the shadow of a thread (enlarged about 200 times) on to a chart consisting of two drawings of the maximum and minimum profiles of the thread (also enlarged in the same ratio as the thread shadow), enables us to see at a glance the exact conditions under which the screw will enter a good nut. The major, minor, and pitch diameters, and the angle of thread are all checked at a glance that tells whether or not the shadow of the thread being tested, lies within the boundaries formed by the maximum and minimum profiles of the chart. It is both a rapid and an accurate method.

Furthermore, the really vital element—the pitch of the thread—is tested over a distance about equal to the standard length of engagement of the screw in the nut (this length can be adjusted) and the cumulative pitch error may be detected if necessary by a simple lead testing device which can be fitted to the machine. This method of testing is quick and accurate and effectively remove the human factor so far as touch is concerned. It has the additional advantage of doing away with the necessity of scrapping gages when the limits on a part are altered. All that is needed is a new chart which can be drawn up in half an hour by any com-

petent draftsman. Internal threads over about 1 in. in diameter can also be tested by this method, by making a sulphur cast of a section of the thread and projecting the shadow of this cast on to the chart.

Another use of the thread comparator, and one which probably was not conceived by the originators of the machine, is that of providing instruction for the screw machine operators. Often, due to the application of too much pressure by the operator, the first few threads of a screw will be thin. This is detected in the shadow and it has been found that by showing the operator the shadow of his product, the cause of this defect has been removed and the workman has gone back to his job with a keener interest.

In this discussion no mention has been made of thread snap-gages or thread micrometers. These were omitted advisedly because they have the same disadvantage as the three wires—they check only the pitch diameters except in the case of some late developments of snap gages which do check all elements, but which are handicapped by the touch element as is the case with most gages.

Why Tools Crack in Hardening

AT A sectional meeting of the American Society for Steel Treating, held at Bethlehem, Pa., a paper was read by F. R. Palmer, metallurgist for the Carpenter Steel Co., Reading, Pa., which was full of meat for those responsible for the design, production and hardening of tools and cutters. Mr. Palmer's paper brought out the fact that while the analysis of the steel is the first factor in the susceptibility of the metal to strain, there are many other factors entering into the failure of steel, when the steel itself is perfectly good. The amount of carbon in the steel should practically determine the quality. As the carbon content is increased, the quality of the steel should be increased. The hazards of hardening are much greater with steel having a high carbon content than with that having a low carbon content. The amount of manganese in the metal should be taken into consideration in determining the quenching medium, and the percentage of tungsten should also be considered in this connection. Steel containing tungsten up to 4 per cent or 5 per cent should be water hardened, while that containing 8 per cent or 9 per cent should be hardened in air or oil.

The first consideration is that of quality, which includes the factors of uniformity and purity, and the next is that of design. For example, the teeth on opposite sides of a cutter should be alternated wherever possible, so that the cutter will be balanced and will therefore heat more uniformly, and keyways should be placed with an eye to the proximity of other sharp corners. If the corners of keyways can be rounded, the danger of cracking in hardening will be materially reduced. Flat surfaces are always more hazardous than round ones, as there are no projections or corners on the round surfaces.

Center Punch Marks Cause Cracks

Center punch marks made by the tool maker or layout man in the shop are also responsible for many cracks in tools. The punch pushes the metal aside as it enters the body of the piece, and the extra density of the metal at this point is responsible for many failures in the heat treatment. Dull cutters produce practically the same effect, as the dull cutting edges push up the surface of the metal, thereby setting up strains and increasing the possibility of loss in hardening. All these are cracking strains and emphasize the importance of the rule that when internal strains exceed the strength of the steel, the steel will crack.

Tools are sometimes cracked by allowing the outside of the piece to heat faster than the interior. At a certain point in the rise of the temperature—known as the critical point—the temperature suddenly lowers a few degrees and then continues rising. If the steel is heated so fast that the critical point is reached at the outside of the piece while the temperature in the interior is still rising, it naturally follows that the temperature at the outside will be rising again at the time when the temperature in the interior of the piece is dropping at the critical point. An inexperienced hardener might, judging from the temperature at the outside of the piece, decide that the piece was up to the proper hardening heat and proceed to quench it, with the result that corners or other parts of the tool will fall off, due to lack of support. If a reamer that is being treated for hardening is quenched just as soon as the outside of the piece appears to be up to the required heat, it is very likely to crack. The reamer should be "soaked" in the the heat long enough so that it will be of the same temperature all through. The pyrometer should not be depended on altogether in treating tools of this kind. The pyrometer may indicate that the proper temperature has been reached, when as a matter of fact the interior of the tool may lack several degrees of being the same temperature as the outside. Steel should not be allowed to soak in a fire of varying temperatures as this produces a coarse, uneven grain in the metal. The heat must be steady or rising. Chrome and chrome-vanadium steel should be soaked at hardening heat in order to obtain the best results.

Many Tools Ruined in Grinding Operation

The grinding operation is also responsible for many tool failures. The tool may be properly designed and carefully hardened, and then may be ruined by an incompetent grinding machine operator. If a tool cracks in the hardening, it is usually the result of a weakness in the steel, but checking is due to overheating the surface of the piece. A piece can be over-heated by taking a cut that is too heavy, by "crowding" the wheel, by allowing the feed belt to become loose, or by using a wheel that is "loaded." The wheel used may be of the proper grade and grain, but if it is used too long without dressing, the friction caused by the material that has accumulated on the surface of the wheel will overheat the surface of the work, causing expansion and resulting in fine cracks called "checks." The checking itself not only ruins the piece, but a piece may develop a crack at the least provocation.

All grinding wheel spindle belts and table feed belts should be kept taut. If a belt becomes loose, it may slip in the middle of a cut and allow the table of the machine to come to a rest with the result that the spot directly under the wheel will be almost instantly overheated. If the temperature of one spot is raised above the critical point, the grain of the metal will separate and the section will fall off the first time any strain is put upon it. A die can very easily be ruined in this manner, without the reason being apparent.

Where Do the Immigrants Go?

ANNOUNCEMENT in the New York press that many of the immigrants now entering the United States are making hasty departure for the farms and cities of the Northwest renews interest in the question as to the sections of the country which are to receive the greatly diminished supply of immigrants now being admitted to the country. The records of the movements of the new arrivals indicate that former occupation and climatic conditions still control the immigrant in determining his future abiding place in the United States.

Following Home Occupations

This is particularly noticeable in the movements of the new arrivals from northern Europe, a large percentage of the Scandinavian arrivals in the opening month of the new fiscal year having already departed for the Upper Mississippi Valley, notably the farms and cities of Minnesota, the Dakotas, Wisconsin and Illinois. With those from the countries of central and southern Europe the opportunities in the factories and mines of the North Atlantic frontage are more attractive, and the bulk of the small additions to our population made under the law which limits the number of each nationality permitted to enter will find homes in the area bounded by the Potomac and Ohio on the South and Rocky Mountains on the West.

This distribution of the new arrivals follows the custom of earlier years. Compilations by the *Trade Record* of the National City Bank of New York show that of the 14,000,000 persons of foreign birth now living in the United States, about 5,000,000 are residents of the Upper Mississippi Valley, 5,000,000 in the Middle Atlantic States, 2,000,000 in New England, about 1,000,000 in the South, and approximately a half million on the Pacific coast.

It is in this detailed study of the final distribution of the immigrants arriving in earlier years, says the *Trade Record*, that the disposition of the home seeker to select climatic conditions and occupational opportunity similar to those of his former home becomes apparent.

The last census of the United States shows the distribution by states of the 14,000,000 persons of foreign birth which still remain out of the total of more than 30,000,000 of arrivals since 1830. Of the more than 1,000,000 Scandinavians in the country in 1920, 220,000 were in the state of Minnesota, nearly 100,000 in the Dakotas, 90,000 in Wisconsin, 150,000 in Illinois, and 60,000 in Iowa, while the great manufacturing state of New York retained less than 100,000 of the more than a million entering through its doors.

Industrial Immigrants

The Germans, while seeking climatic conditions similar to those of their own country, are less devoted to agriculture than their Scandinavian neighbors, and of the 1,686,000 in the country in 1920, 295,000 were in the state of New York, 120,000 in Pennsylvania, 205,000 in Illinois, 151,000 in Wisconsin, 100,000 in Minnesota and the Dakotas.

The Poles, while accustomed to climatic conditions of northern Europe, are apparently less devoted to agriculture than some of their immediate neighbors, and they are found in those states offering opportunities in the mining and manufacturing industries, for of the 1,140,000 Poles in the United States in 1920, 247,000 were in the state of New York, 178,000 in Pennsylvania, 162,000 in Illinois, 103,000 in Michigan, and about 150,000 in New England as a whole.

The cosmopolitan Britisher distributes himself very widely. Of the 850,000 in the United States, 135,000 were in New York, 147,000 in New England, 90,000 in Pennsylvania, 54,000 in Illinois, 47,000 in Michigan, 43,000 in Ohio, 87,000 on the Pacific Coast, and 45,000 in the Mountain states.

Of the 1,037,000 natives of Ireland, the states having big cities get the bulk, New York 284,000, Massachusetts 183,000, Pennsylvania 121,000, and Illinois 75,000, having the largest shares.

Of the 1,400,000 Russians, the mining and manufacturing states had the bulk, New York 529,000, Pennsylvania 161,000, Illinois 117,000, New England 147,000. This is also true of the Italians, for of the 1,610,000 in the United States in 1920, 545,000 were in New York, 222,000 in Pennsylvania, 157,000 in New Jersey, and 117,000 in Massachusetts.

The South gets but a small percentage of the home seekers, due probably to climatic conditions and what is presumed to be a more plentiful supply of labor, for of the 14,000,000 persons of foreign birth in the United States in 1920, the entire South had less than 1,000,000, while the single state of New York had 2,876,000, Pennsylvania 1,387,000, Illinois 1,200,000, and Massachusetts 1,077,000.

How It Sounds in French

One of the French export magazines published a description of the new Crescent Kit recently. Here's what the poor French have to read, translated literally, word for word:

KIT OF ADVANTAGEOUS TOOLS

One of the most important makers of tools in the world has just hurled onto the market a kit of tools which is considered the most practical and the most useful in existence, and that which interests the more specially the importers, that kit sells itself at a moderate price.

It composes itself of a Crescent wrench truly of eight inches, of a plier thin straight nose Crescent of six inches, and the famous Crescent screwdriver, the whole hiding in an envelope of tough brown voile which occupies so little a place that one can easily carry the entire kit in her pocket or in the lateral pocket of the automobile.

The thin nose Crescent plier belongs to general works and is very comfortable in narrow straits. She is forged at the hammer durable and tempered with oil. The Crescent screwdriver is of the type of hammers conceived in a fashion that he who has a hand is able to rest it in a position where is formed a "T", after having given it a turn to the right angle, that which give is a force of irresistable leverage which can make penetrate without difficulty the most rebellious screw into the most durable wood. A pushing spring maintains the sleeve firmly in the one position as in the other. Someone is able to serve the sleeve like a hammer if one desires.

The Crescent Tool Company of Jamestown, N. Y., U. S. A., fabricates this kit so useful of which all the world has needs, for she contains the three tools most necessary. The carpenters, the ranchers, the plumbers, the electricians, the machinists, etc., are able to make the more part of their work with the aid of these sole tools—the greater argument of sale is that these three tools of quality superior are able easily to be carried on himself, and that they are above everything, of easy access.

Write to the maker to demand descriptive imprints and complete books on the occasions which offers this kit to the merchants of the entire world.

Two Good Railroad Shops

BY FRANK C. HUDSON

The difference between railroad and other shops—Specifying good machines and getting something entirely different—Need for standardization—Oil-saving not always an economy

WE HAVE recently visited two railroad shops which had been recommended as being particularly "good" shops by machine-tool men. And the very fact that they were pointed out as being way above the average, shows how very low the standard of railway shops really is in comparison with other shops. These are "good" shops as railway shops go, far better than the average. They have some very good machinery and more is on the way. But right beside the new machines we found old drilling machines which must have been doing duty when Garfield was President, grinding and milling machines that dated back forty years and other equipment to match.

One of the shops which had been suggested as having good equipment, bore out the fact that most machine men have entirely different standards in judging railroad shops. The other shop which was highly recommended, had a few good tools but a number of them dated back to 1881, when the shop was built. A new roundhouse had been built and boasted one new lathe and a drill grinder. The rest of the equipment had been gathered up from various parts of the system and dumped into the new shop.

This, however, is not a reflection on the mechanical men in charge, they all wanted better equipment. They had put in requisitions for new machines for so many years that it had become a habit—and they were almost shocked when a new machine really came through. Nor must we blame them because the few machines that did materialize, were not those best adapted to the work.

THE "JUST AS GOOD" DISEASE

Specifying machine equipment is much like the grab bag at a church fair. You know what you want but you haven't any idea what the average purchasing agent is going to hand you. When it comes to substituting "just as good" the P. A. can give the drug clerk a full hand and win in a walk. And when a shop superintendent has been handed a few lemons in the way of machines, it sort of takes the ambition out of him, so it is small wonder that he doesn't lay awake nights to find better methods. Nor does it encourage the workmen to see the officials' fine private cars and poor machine equipment on the same road.

The two shops referred to, showed a fair uniformity in milling cutters, reamers, etc. The coarse tooth milling cutters prevailed but they were not of the same brand, because the P. A.'s eyesight was sometimes bad when it came to reading the make of cutters specified. The cost of repairs was also higher than it should have been because of the great variety of locomotives to be repaired and the lack of standards for parts to be used in such repairs.

This is where Ford's plan of replacing crankpins and parts of standard dimensions will pay in the long run —standard parts can be carried in stock just as with automobile repairs. It will mean not only cheaper repairs but that the locomotives will be returned to service in less time, which counts even more.

SHOP EXECUTIVES PREFER STANDARDIZATION

No one appreciates the advantages of this standardization more than the live executive in the railroad repair-shop, but he is helpless in most cases to begin any standardization work of this kind. For example, the Ford method of using hardened vanadium-steel hub liners, costs much more than the usual brass or babbitt liners. But Ford's liners have already run nearly two years with a wear of but $\frac{1}{8}$ in. on the bronze rings in the driving boxes, while the bronze hub liners will rarely run more than a few months before requiring renewal. While it is much easier to renew the bronze rings in the driving boxes, yet the difference in service obtained from the locomotive will soon offset the extra cost of doing a good job.

Another item of expense in repairing locomotives comes from the lack of proper lubrication, for there are still many traces of the great wave of oil economy which swept over the railroad field about twenty-five years ago. While there is no doubt that much oil was wasted, just as there is in lubricating all kinds of machinery, it is safe to say that every ten-cents worth of oil saved has cost the railroads at least a dollar in repairs. When a locomotive comes in for repairs in such a condition that the piston valve has to be forced out of the bushing with a hydraulic jack, one can get some idea of the power wasted in the locomotive itself.

Nor is this all. The valve that is stuck in place, and there are many, frequently has to be replaced, as well as the valve bushing in which it runs. Pistons wear more rapidly than they should, from insufficient oil, and must be built up (usually with bronze) by oxy-acetylene welding, or replaced by new ones. Piston and valve rods also wear unduly from the same cause and require regrinding, seldom to a standard size, so that the packing must be bored to fit.

A very suggestive incident regarding lubrication occurred in one of the shops visited. During the strike the foremen and other shop executives went into this shop to try and keep the motive power in operation. The chief gave orders to let up on the restrictions as to oil, if they wanted to keep the engines moving. Lack of oil caused more repairs than they could handle.

In one of the shops, complete spare boilers are built for different classes of locomotives and held in reserve. Then, when a locomotive comes in for general repairs, a new boiler can be quickly substituted for the old one, which can be repaired without holding the locomotive out of service.

Another time-saving method is in the use of steel bushings in the spring hanger links. These bushings are forced in the eyes of the links and the whole thing casehardened, as is the pin. The pin is not finished but fits the bushing within a sixteenth of an inch or less. If the bushing wears it can be easily pushed out and a new one put in place, or a new pin used, or both.

As one bright shop superintendent put it, the railroad produces two things, transportation and scrap. They try to keep the scrap as low as possible by utilizing it so far as possible. It sometimes takes close figuring to know when to throw away a part and when to salvage it. In the case of tool equipment it is nearly always necessary to salvage it and patch it up, because of the difficulty in getting a new one. And it sometimes happens that with the limited output of a given kind or size, the fudged-up machine may justify itself even without the alibi of the new machines not being forthcoming.

The solution of one of the main problems in locomotive maintenance-costs, is to reduce the kinds of locomotives used in similar service, to standardize parts so far as possible and to make these parts at a central point for distribution to the different repair shops. This practice is well known to many railway shop-men but, being helpless to bring about the change, they must plod along doing the best they can under the unfavorable conditions imposed upon them by those who know nothing of machine costs, but only of stock quotations and the financial statements which affect them.

Every railroad shop executive visited was interested in Ford's plan of standardizing the parts of his locomotives to save making and carrying so many different parts for repair work. They agreed that while his repairs were costing more money than theirs, it would prove economical when spread over a period of years. And several wanted to know if the Ford repair shop bought the machines the executives wanted or if they had to take whatever the purchasing agent sent them. All of which is significant and bears out the contention that most of the blame for non-standardization and for poor machine equipment must be laid at the doors of those outside the mechanical departments of the railroads.

The Man Who Knows Why—Discussion

By John Thomas

Entropy's article under the above head on page 734, Vol. 58, of the *American Machinist*, is very interesting. Knowing how and why is education, and how the information is acquired makes little difference. It may be acquired from individuals, from books, by experiment or by means of analysis and deduction.

Psychologists tell us that at six years of age we have all of the intelligence we ever will have, that is, we have all of the mental tools we will ever get; beyond that age we can only develop what we already have. We can store up facts in our own minds, and even discover new ones, if we will only use the mental equipment we have.

All successful men have the power of deduction to a marked degree, whether college men or not. The college man has some advantage since, in his particular line, he has a good idea of what has been done and is able to start where others have left off. The practical man in studying the same subject may waste his time and energy in going over material that has already been worked out to a conclusion.

Analysis and deduction are about our only means of mentally looking into the unknown. By assembling known facts we may, by means of deduction, discover other facts previously unknown to us. Excepting those made by accident, most of our great industrial and scientific discoveries have been due to deduction. The scientist reasons to a conclusion and then verifies or disproves by experiment.

We can all increase our reasoning powers by simply asking questions of ourselves and then depending on our own minds for a solution. We must remember, however, that one solution seldom exhausts the possibilities of any problem. The mind should be trained to look at a problem from many angles. For practice and to make the solution of real value to us it is best to select problems which have a direct bearing on our daily work. No matter what our job may be, there must surely be something about it which we do not know or understand. If we take up one of these problems at a time, concentrate on it whenever we have an opportunity, and "stay with it" until we have at least one solution, in a short time it will be found that the mind will take up and solve ordinary problems almost automatically. Once the habit is acquired, little effort is needed to concentrate. This accounts for the rapid and accurate decisions of some great executives.

Occasionally we hear of men who complain that their jobs are uninteresting and monotonous. This is almost a sure sign that they are not looking for problems concerning their work, much less trying to solve them. We cannot improve our work without first giving it some thought.

What has all this to do with the machine shop? Just this—big and little alike we seem to have gotten out of the way of constructive thinking. Most of the time we only think we think and nearly all of us are apt to imagine, at times, that some kind of business other than the one we happen to be in, would be much more profitable to us. The fact of the matter is that someone has made a success in every kind of business under the sun, the only difference being that the successful man puts more brains in his business than did the rest.

Every day we are literally stumbling over opportunities for improvement and money saving in our work, simply because we will not stop long enough to take up and really examine even one of our many problems, and concentrate on it long enough to find a solution. In the shop we use up all our steam trying to get out a large production and, at the same time, give practically no thought as to whether we might be able to find more economical methods of production. We are entirely too well satisfied with things as they are. Trying to find a better method is just as important a part of managing a shop or plant as is getting out production, in fact we must improve or be left behind. Progress is being made continually in all lines of business and we can all have at least a small part in it, if we will only use our brains.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Bars for Boring Cylinders and Valve Ports

BY HAROLD BROWN

The boring equipment shown in the accompanying illustrations was designed primarily for boring the cylinder and valve ports of a 16x36-in. Corliss engine. The time necessary to do the job being of utmost importance, the devices were made with this condition constantly in mind.

The bar for boring the cylinder, Fig. 1, consists of

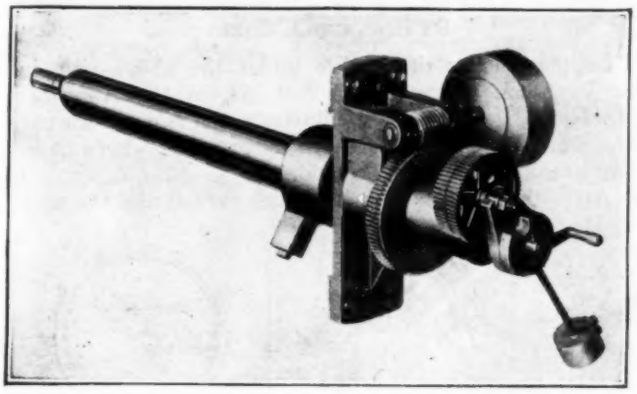


FIG. 1—BAR FOR BORING CYLINDERS

a hollow casting, 5 in. in diameter and having a ¾-in. slot cast in one side to accommodate the feed screw and a solid pilot 2½ in. in diameter, which is the same size as the piston rod. A cutter head mounted on the bar is driven by a key projecting through the slot,

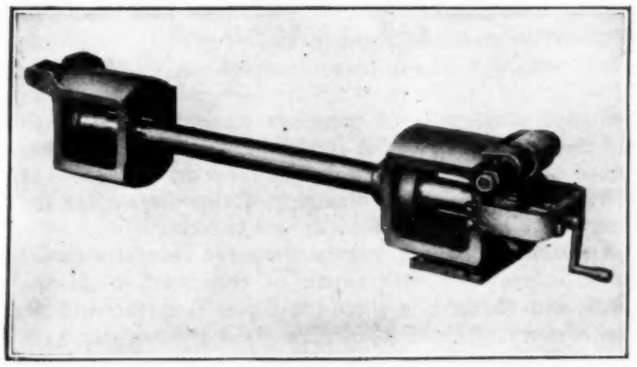


FIG. 2—BAR FOR BORING VALVE PORTS

the key also forming the nut for the feed screw. The bracket shown is machined to fit the counterbore of the cylinder and is provided with holes to fit over the cylinder studs for clamping. The bracket is also provided with lugs for carrying the driving worm and pulley.

The feed mechanism consists of a pinion fixed to the bar and a pinion fixed to the screw, the large gears shown being mounted on a stud and so arranged as to give a differential feed to the screw. The speed of the bar is 25 ft. per min., and the feed is 0.025 in. per revolution for roughing, and 0.010 in. for finishing.

The feed gears were selected from a set of change gears from another machine.

As the engine was in operation when the bar was made, it was necessary to make the bar to an approximate length and after the engine was disassembled, the correct length was determined and a space collar of pipe was used to make up the additional length of bar, the collar being shown between the worm gear and feed gears.

The valve-port boring rig shown in Fig. 2 was designed on the same principle as the bar for boring the cylinder, the ends of the brackets being turned to fit the counterbore of the valve ports. The bar was made of steel and drilled from the solid to accommodate the feed screw and driving key. To bore the cylinder, it was necessary to make a bushing to fit the stuffing box of the engine and the pilot on the boring bar. The actual time for taking three cuts with the cylinder boring equipment was 16 hours. The valve-port boring equipment required 4 hours per hole or a total of 16 hours time for the 4 holes.

As the plant was to be shut down only one week to make all repairs, a sufficient time was allowed in which to turn the valves, making a new bull ring and new packing rings for the piston and to do the necessary repair work to the valve mechanism. The engine was assembled on Friday, the valves were adjusted and set and the engine tried out on Saturday. It was started on the following Monday and has been in operation ever since.

The labor cost of making the equipment is as follows: Design, 15 hr. Pattern, 50 hr. Machining and assembling, 140 hours.

Boring Bar for Stellite Tools

BY GENE PHELPS

Those who have used Stellite as a cutting tool in a boring bar probably have experienced difficulty in clamping the tool as tightly as desired, due to the possibility of its breaking under pressure. The average boring bar, such as used on turret lathes, is provided with a square hole sufficiently large that a tool bit or boring tool will have a slight clearance. The clamping is accomplished by means of a setscrew which contacts directly onto the tool. Stellite, being somewhat more brittle than other tools, is subjected to fractures if held by this method, especially if the square hole is not straight and the tool does not have an even bearing. The drawings given illustrate a bar designed to overcome this trouble, which has many features worth consideration, even if used with other types of tools.

There is shown in Fig. 1 the bar *A*, assembled with boring tool and holder in position. A reamed hole in

the bar receives the toolholder *B* and the clamp *C*, the holder being a pressed or driven fit and the clamp a loose fit. The holder should be hardened and have a ground slot so that the tool *D* will be a snug fit in it. The clamp is held from falling out by means of the pin *E* which is pressed into the holder as shown. A

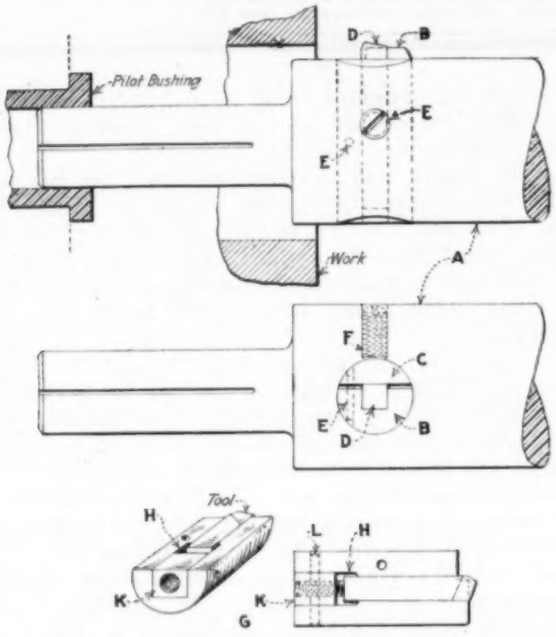


FIG. 1—BORING BAR FOR STELLITE TOOLS

setscrew *F* applies pressure on the clamp, which bears on the tool. This method of clamping is suited to Stellite, as the pressure is evenly distributed over the

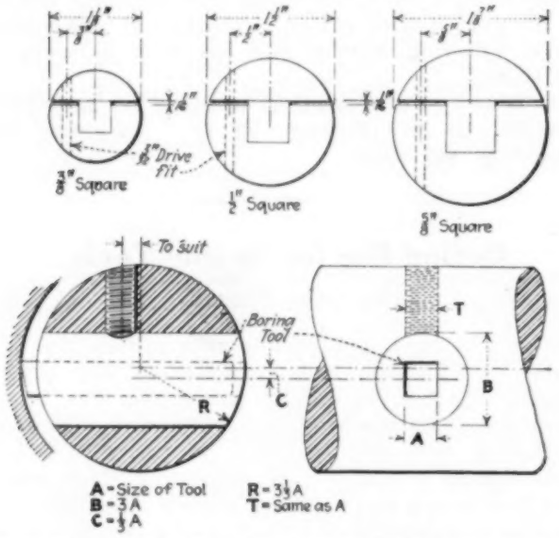


FIG. 2—SIZES OF BAR AND HOLDER FOR ⅜, ½ AND ⅝-IN. TOOLS

entire top of the tool instead of at one point as is the case when a setscrew only is used.

It is sometimes desirous to use a backing-up screw for adjusting purposes and at *G* is shown a method for use with this type of boring bar. The tool slot in the holder is enlarged at *H* and a block *K* is assembled as shown. It is held by a pin *L* so that it will not be forced out when the setscrew is tightened against the tool.

Some details of construction are shown in Fig. 2 for use with ⅜-in., ½-in., and ⅝-in. square tools. A section of the boring bar is shown with recommended dimensions, although slight changes will not matter, providing of course that the bar is not weakened by the hole enough to permit it to warp or twist under pressure of the cut. The hole should be placed somewhat below the center line of the bar so that the tool will have the proper position relative to the center line of the work. The setscrew used for the clamp is shown forward of the center of the bar, an arrangement which has a slight advantage; yet if required, two setscrews can be used. The tabulations shown will work satisfactorily on tools of sizes other than those shown.

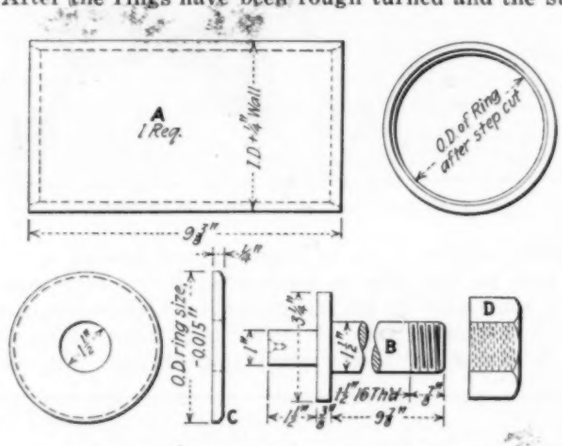
The principle of this design is ideal for Stellite application and has proved very successful in increasing feeds and speeds without any trouble in tool breakage.

Making Piston Rings Round—Discussion

BY LEONARD A. GAREY

Supplementing the article under the above title by E. V. Allen, on page 527, Vol. 58, of the *American Machinist*, I would like to illustrate the method we use, and which I believe to be entirely practical where quantity production is to be considered.

After the rings have been rough turned and the step-



ARBOR FOR GRINDING PISTON RINGS

cut made, a quantity of them are stacked on the bench and the sleeve shown at *A* in the accompanying drawing forced over them. The inner diameter of the sleeve is 0.001 in. over the outer diameter of the rings *after* the ends of the latter have been forced together.

An arbor, *B*, which may be used for several sizes of rings, is provided with a pair of collars, *C*, to fit the arbor and the end is threaded for a clamping nut *D*. The corners of the collars as well as the bore at each end of the sleeve should be slightly chamfered in order to render the assembling somewhat easier.

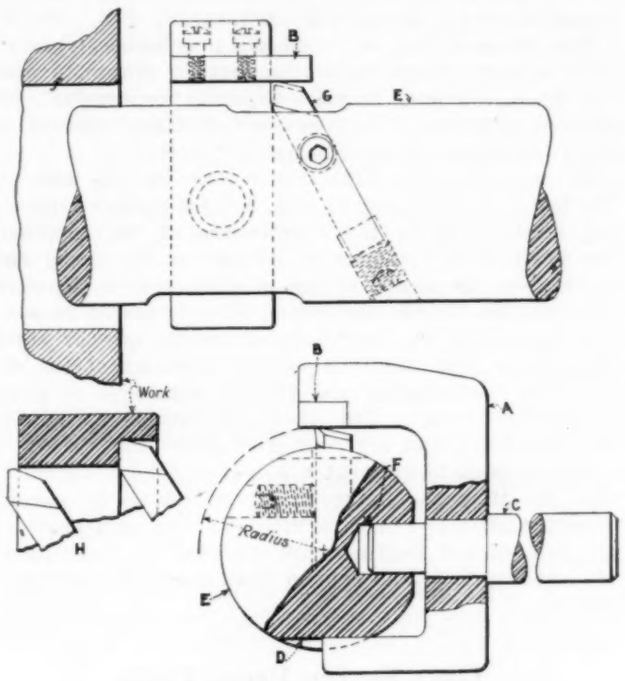
With one collar on the arbor the sleeve full of rings is placed in position, the other collar put on and the clamping nut run up. As the inner diameter of the sleeve is but 0.016 in. larger than the outer diameter of the collars it is easy to set it approximately true with the latter before finally tightening the nut.

After tightening the nut enough to hold the rings securely by the end pressure of the collars, the sleeve may be driven off and the rings turned or ground to the nominal diameter of the cylinder.

Gage for Setting Boring Tool

By Gene Phelps

Users of boring bars such as applied on turret lathes, are familiar with the difficulties encountered in correctly setting boring tools where limits of accuracy are close. Tools are often set to a finished piece of work; but they generally require adjusting, either one way or the other, before the proper size is obtained. If a piece of work of correct size is not available, the operation of



GAGE FOR SETTING BORING TOOL

setting a boring tool can be called one of "guess and try."

Micrometers are often used for this purpose with more or less success, but due to the small adjusting surface of the anvil, it is not safe to depend upon these settings. Gages of many styles have been made for tool setting on various machining operations; but it does not appear that in the case of the boring bar as many gages are used in setting the cutting tools as might be employed to advantage.

The accompanying illustration is an example of a gage used when boring an aeroplane engine, and which has proved very satisfactory in setting the tool correctly and rapidly. The general design is simple in that there are only three parts in the unit, the body *A*, the hardened set-block *B* and the locating plug *C*. It is necessary to machine a flat portion *D* on the boring bar *E*, in order that the lower arm of the gage body will fit as shown. A hole *F* is also made in the bar, so that the plug *C*, which is fastened in the gage body, will enter into it as the gage is set in the proper position.

The distance between the center line of the plug and the flat portion of the arm should be held very accurately to size, to make the gage fit on the boring bar with a push fit, for any play will cause improper tool setting. After the gage is in position, the tool *G* is adjusted to the set-block *B*. The tool is then clamped in position and the gage removed, completing the setting operation and leaving the boring bar ready for use.

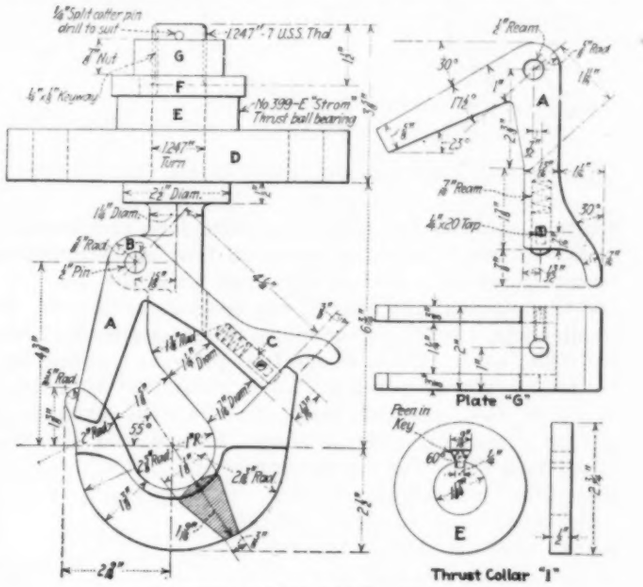
After using this gage a few times it will be easy to determine the correct pressure for setting the tool to the set-block, so that an accurate hole may be bored within proper limits. The arm of the gage block should be made of cold-rolled steel, cyanided; the plug of machinery steel, hardened and ground; and the boring bar should be heat-treated to give proper wearing qualities. A bushing can be placed in the boring bar if desired, so that constant use will not rapidly wear the hole *F* and cause errors due to looseness of the gage when fitted to the bar.

Feelers will be found of assistance when machining both rough and finished holes, and various styles of set-blocks can be used for cuts such as shown at *H*. Thus one gage body may be used for several different pieces of work which it may be necessary to machine in small quantities with the same boring bar.

A Safe Crane Hook

By Harold A. Peters

In lifting motors from the test stand to the bench for repairs or adjustment and then back to the stand again, we experienced trouble from slippage of the crane hook, dropping a motor now and then and some-



SAFETY HOOK FOR A CRANE

times narrowly escaping injury to workmen. The safety hook shown in the sketch was devised to avoid this danger.

As the drawing shows, the body of the hook is straddled by the catch *A*, which hinges on the pin *B*. When the hook is carrying its load the catch is held in position by the plunger *C* and the coil spring shown.

The machine-steel support *D*, from which the hook is suspended bears against the ball thrust bearing *E*, which in turn bears against the hardened collar *F*. The collar is prevented from turning by means of a dovetailed key. The nut *G* holds the parts together and is retained by a cotter pin.

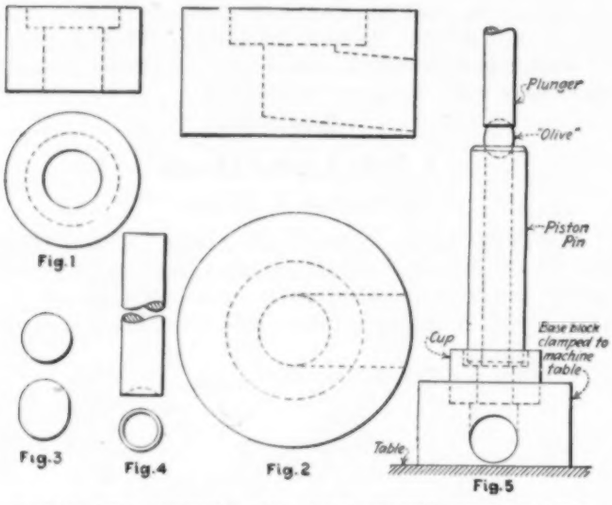
This type of hook has been in service for several months and has proved very satisfactory and reliable. The dimensions given in the sketch are for a hook of 1½ ton capacity, and will be perfectly safe if proper material is used.

Salvaging Automobile Engine Piston Pins

By Francis M. Weston, Jr.

When an automobile or aviation-engine piston pin becomes so badly worn that it can no longer be used, it can be put into service again at a cost of about 25 cents.

In order to be made serviceable, a worn pin must be expanded to a little more than its original diameter and reground. This requires that the pin be annealed before expanding and then hardened again. When the



TOOLS AND METHOD FOR EXPANDING PISTON PINS

pins are accumulated from successive jobs and handled in lots of two hundred or more, all four operations can be completed at a cost of not more than 25c. per pin, and that without the need of any special machinery. In smaller lots, twenty-five or more, this cost rises to from 30 to 35c. each. Three of the four processes, annealing, hardening and grinding are so familiar that they need no more than passing mention. But the expanding process, requiring only a simple fixture and the use of either a slotter or a power press of some kind, may be of interest.

A cup and base block to hold the pin on the machine table, a plunger and a set of hardened tool steel "olives," comprise the entire equipment.

The cup, Fig. 1, is designed to support the piston pin in a vertical position under the plunger of the machine. The drilled hole in the center must be a little larger that the hole in the pin will be after expanding. The counterbore is enough larger than the outside diameter of the pin so that it will not bind during a normal amount of expanding of the pin. The cup fits snugly into a counterbore in the base block, a separate cup being needed for each type of piston pin handled. The outside diameters of all the cups are the same, but the counterbores and central holes suit the particular type of pin for which the cup is intended.

The base block, Fig. 2, merely receives the cup and holds it central on the table of the machine. The holes in the top and side must be larger than the largest olive used in order to insure the prompt delivery of the olive after it has passed through the pin.

The olive, Fig. 3, is an elongated ball of tool steel, hardened and ground. It is pushed through the annealed piston pin under the action of the plunger, expanding the pin. A set of four or five olives, each 0.002 in. larger than the one preceding, is required for each type of pin to be treated. The smallest of each set is 0.002 in. larger than the original inside diameter of the pin for which it is intended. The size, or sequence, should be marked on the end.

The plunger, Fig. 4, is merely a cylindrical bar of steel a little longer than the longest pin and small enough in diameter to pass through the smallest pin without touching. Its lower end is made concave to avoid the chance of its slipping on the olive.

In operation, the fixture is set up on the table of the machine as shown in Fig. 5. An annealed piston pin is stood up in the counterbore of the cup, and the smallest olive placed in position on the upper end of the pin. A stroke of the machine shoves the olive through the pin and the second olive is placed in position ready for the next stroke. After two or three olives have been used, the outside diameter of the pin is tested with a gage and further expansion is given if found necessary. The olives roll through the hole in the base block and are recovered after each stroke.

It has been found that a helper can be assigned to this job after the fixture has been set up by a competent machinist. With a little practice, and provided the pins do not require more than two or three olives for expansion, he can expand from thirty to forty pins per hour.

Time-Saving Press Tools

By S. A. McDonald

When small holes are punched in heavy stock, the wear on the punch and die calls for frequent stops for sharpening. This sharpening sometimes becomes necessary at the most inconvenient time and if it is possible, the operators will use a dull punch or die long after it is too dull to do good work, rather than go to the trouble of taking out the dull tool and sharpening it.

This condition existed in our shop until the tooling arrangement shown in Fig. 1 was made.

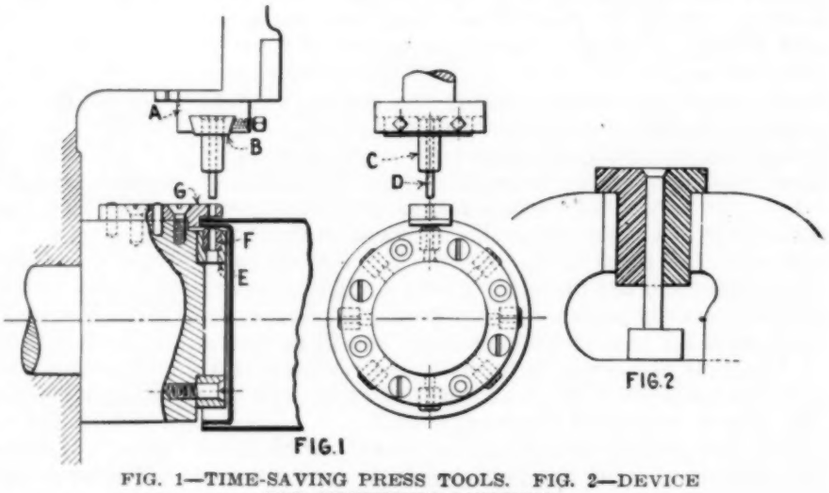


FIG. 1—TIME-SAVING PRESS TOOLS. FIG. 2—DEVICE FOR UPSETTING PUNCHES

A horn press was used for punching rivet holes in tanks. The punch holder *A* has a dovetail slot to which a pad *B* is fitted. In this pad is the punch sleeve *C* which contains the punch *D*. The punch sleeve has a tapered head to prevent it from pulling out of the pad. A lot of punches were made from drill rod and after being hardened at one end, they were upset at the other end in the device shown in Fig. 2. They were then straightened and the cutting ends ground.

On the end of the horn is located the machine-steel die ring *E* which contains eight hardened dies *F*. The stripper plate *G* is fastened to the top of the horn as shown. One end of the work (a tank with a flanged end) is located on the end of the horn, the other end resting in a cradle. As each hole is punched the tank is revolved to the position of the next hole.

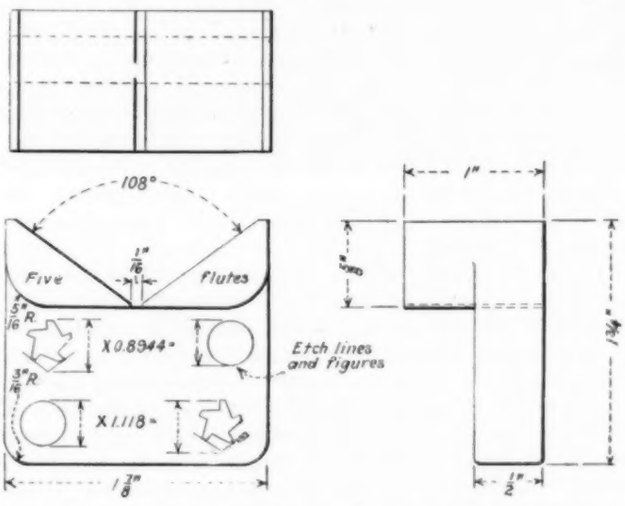
As the stock is heavy and the holes small, the wear is great on both punch and die. When a punch is dull the pad *B* is taken out and a sharp punch put in its place and the pad put back. Before tightening the pad in place, the ram of the press is brought down by hand and the punch located by entering it in the die. The renewing of the die is a simpler matter still. All that is necessary is to loosen the die ring, revolve it to bring the next die under the punch and lock it in position. When all the dies are dull, the ring is removed and the dies either sharpened or renewed.

V-Block for Measuring Five-Fluted Cutters

By G. B. Olson

The V-block illustrated makes the measuring of five-fluted cutters a simple proposition. All that is required is a regular micrometer and the use of one of the constants given below.

A good way to make the V-block is to use a standard



V-BLOCK FOR MEASURING FIVE-FLUTED CUTTERS

one-inch plug and grind the V to the dimension shown on the lower formula. With the plug placed in the V, the dimension from the top of the plug down to the horizontal line should be 1.118 in. When ground to this dimension and to the angle shown, the two lines of the angle will intersect the horizontal line.

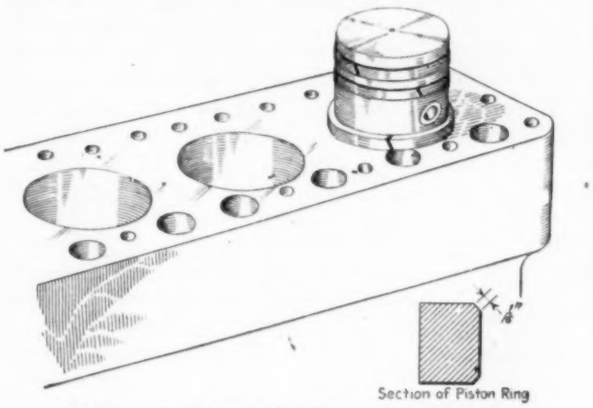
The formulas should be etched on the block as shown. The top formula, which is the reciprocal of the lower one, is carried to only four figures, which is close enough for ordinary work. If more accuracy is required, it can be carried further.

Assembling Piston Rings in Cylinders

By H. L. Wheeler

When assembling piston rings in gas engine cylinders I use an old piston ring, snapping it over each ring before it enters the bore, as shown in the illustration. I have found this to be a very easy and simple way, and better than any other makeshift devices and methods I have tried. It is quite as efficient as some of the special tools made for the purpose.

A ring of the same size as used in the piston has just



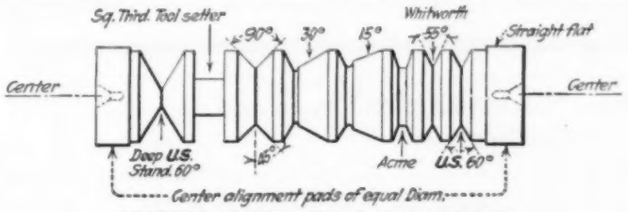
COMPRESSING RINGS FOR ASSEMBLING

enough spring to hold the ring being entered, in its true position, and the piston will push down very easily. The guide ring should be beveled on the inner edges with a file as shown in the section.

A Setting Gage for Lathe Tools

By Joe V. Romig

A handy tool for toolmakers who have much threading and similar work to do is shown in the accompanying illustration. It should be made of a good piece



SETTING GAGE FOR LATHE TOOLS

of annealed tool-steel, and due care should be exercised to make the various angles correct.

The ends should be carefully finished to like diameters so that the tool can be used to align the lathe centers by checking the position of each end with a dial gage.

The deep V-groove is handy for setting large threading tools, while clearance for square threading tools is made certain by slipping them into the square groove. All tools should correspond exactly in height to the center line of the lathe when the setting is made.

[We are not so sure that "clearance for square threading tools is made certain," etc.; what about the lead or helix angle of the thread?—Editor.]

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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
August 9, 1923

President Harding

The sorrow of the nation at the death of its President, Warren Gamaliel Harding, is profound. Coming as it did, just as he was reported out of danger, the news was a distinct shock to the hundred and ten millions of the United States. Warren Harding is dead, but he will always live in the memory of the great country which he led.

The President commanded the love of the individual and the faith of industry. He surrounded himself by capable men, who understood their chief and the needs of the country. Because he took them into his confidence and delegated to them, so far as he could, the responsibilities of their offices, he has prepared the country in no small measure to continue a straight course during the change of the watch.

As a nation, we can do nothing that would be more characteristic of our dead president than to "carry-on," and we are heartened by this statement of our new leader, Calvin Coolidge, thirtieth President of the United States:

"It will be my purpose to carry out the policies which he had begun for the service of the American people and for meeting their responsibilities wherever they may arise.

"For this purpose I shall seek the co-operation of all those who have been associated with the President during his term of office. Those who have given their efforts to assist him, I wish to remain in office, that they may assist me. I have faith that God will direct the destinies of our nation."

How Much Shall We Pay For Insurance?

MOST men who profess to have any familiarity at all with modern business principles accept the soundness of providing for insurance against death, fire, accident or other unforeseen or unpreventable occurrence.

Death, fires and accidents happen with such distressing frequency that people are forced to reckon with them at every turn and protect themselves or their dependents as best they can. Wars, on the contrary, have been so infrequent in the life of the United States that no sooner is one over than the great majority of the people settle down with a sigh to the vain belief that there will never be another. Sad to say, it never works out that way.

It would seem the part of wisdom to insure ourselves as far as possible against the recurrence of a catastrophe so disastrous as the Great War. It is futile to contend that we can escape from taking a part in the affairs of Europe or of any other important division of our world. Modern communication and transportation facilities have settled that once and for all. Would that the complete disarmament of one great nation would result in similar action by all others! The chances against it are incalculable. Would any insurance company assume the risk?

With things as they are there remains but one form of insurance for the nation: The maximum preparedness at the minimum cost to the taxpayer. How the compromise is to be reached between the two opposite factors is a problem for experts. One thing at least seems certain. Obsolete methods and implements of warfare should be scrapped at once and all efforts concentrated on the development and maintenance of the weapons likely to be used when trouble again threatens.

Perhaps the most modern arm is the airplane. Certainly the French are placing immense faith in it and of late the British are taking a keener interest. The chief of our own army air service has asked for twenty-five millions to maintain our skeleton force at its present low strength and carry on the experimental work vital to progress. Certain worthy pacifistic Congressmen will do their utmost to reduce the amount asked by General Patrick and it is therefore up to hardheaded and practical business men and manufacturers to state in no uncertain terms where they stand on the maintenance of our air force so that those members of Congress who really have the welfare of the country at heart may be strengthened in their fight against the vote-seeking politicians and soft-headed sentimentalists. Insurance against war can be had in no better way under present conditions.

The Can Opener Comes into its Own

NO LONGER must the festive can opener confine its activities to meek and lowly occupations; no longer must it be only the "open-sesame" to one of the fifty-seven varieties. It has graduated from being an instrument of kitchen necessity in modern civilization, to being an adjunct of luxury in the garage, the habitat of the motor car. For while its vocation may still link it with the odors of canned beans and spaghetti, its avocation brings to it the much more expensive perfumes of gasoline.

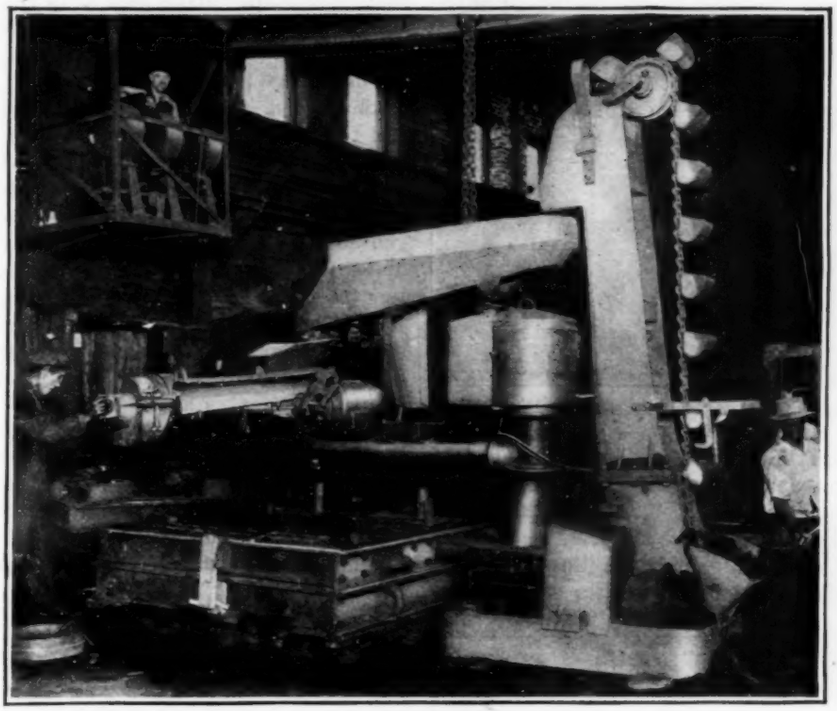
In other words the can opener now forms part of the kit for applying a nifty cowl ventilator to any variety of auto from which this luxury is omitted, be it the humble flivver or the more costly variety. All you have to do is to buy a cowl ventilator and with it comes a drill and a can opener. You lay out the desired openings, worry your way through the tin or whatever metal your particular "can" happens to be made of, insert the can opener and the opening is cut as easily as though you were in the kitchen toying with a can of pork and beans.

And so, as the energetic citizen struggles onward and upward, he uplifts not only his neighbors and the community, but also the tools with which he carves his way to fame and fortune. And the kitchen utensil which was once an insignificant adjunct to a can of soup, is now a "tool" in the kit of the garage mechanics.

Shop Equipment News

Beardsley-Piper Portable Type Sandslinger

Of particular interest to general jobbing foundries, as well as others, is the portable type "Sandslinger" recently placed on the market by the Beardsley-Piper Co., 312 Union Park Court, Chicago, Ill. This machine is an addition to the line of molding machines manufactured by this company, which also includes stationary, tractor and locomotive types.



BEARDSLEY-PIPER PORTABLE TYPE SANDSLINGER

The accompanying illustration shows the portable machine in operation in a foundry. A jointed swinging arm is pivoted on a heavy base in which is arranged a hydraulic leveling device for leveling the machine as soon as it is placed on the floor. The sand is shoveled into a hopper and carried by a vertical bucket elevator to an oscillating riddle mounted on the main arm. The riddle is so constructed that scrap, gaggers and cores work to the front where they are delivered to a chute and deposited in a scrap box also mounted on the arm. The riddled sand is deposited in a hopper on the impeller arm and is carried to the impeller head by a conveyor belt. The impeller head discharges the sand into the mold by centrifugal force.

The impeller head not only throws sand at high velocity but forms wads or compressed handfuls before projecting the sand into the flask. A single blade or paddle is fitted to the head and since this is the only part of the machine liable to wear out quickly, it is a simple iron casting of which a quantity may be made in the foundry and kept for replacement. The casting costs little and is quickly replaced.

The maximum radius of the jointed arm is 10 ft. and, if the mold is too large to be entirely reached by the arm, the whole machine can be lifted and placed in another position by the crane before completing the making of the mold. The arm pivots are fitted with ball and Timken roller bearings so that the head is easily swung over the flask and any desired density in any part of the mold may be obtained by regulating the speed of the impeller head. The impeller head paddle revolves at motor speed and will sling sand at from 2,700 to 6,000 ft. per min. The machine will riddle and ram from 7 to 10 cu.ft. of sand per min., and no special flask or pattern equipment is necessary. It will ram to a depth of 10 ft. and may be used on pit jobs if required. Best production on small molds is made in conjunction with a stripping plate machine. No additional ramming is required.

Three motors are used, one for the impeller head and belt conveyor, one for the riddle and one for the bucket elevator. The impeller shaft is mounted in Timken bearings. Gears are hardened and ground and are lubricated by a splash system. All working parts are protected from sand.

It is stated that the "Sandslinger" does not wear or damage patterns as much as hand ramming, since the first sand thrown into the mold covers and protects the pattern from that which follows. The overall height of the machine is 11 ft. 6 in. and the discharge outlet of the impeller is 3 ft. 9 in. above the floor.

Wallace 6-Inch Bench Lathe

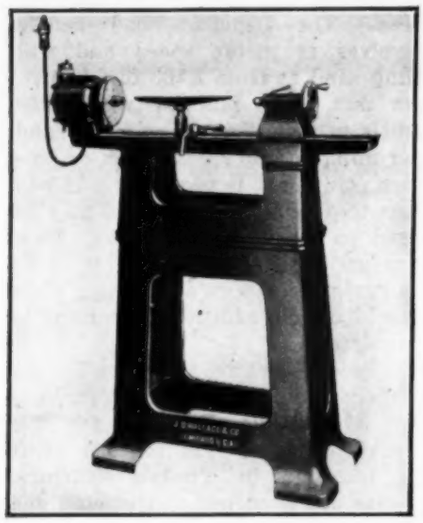
J. D. Wallace & Co., 1401 W. Jackson Blvd., Chicago, Ill., have recently introduced a 6-in. bench lathe for use in pattern and woodworking shops.

The principal feature of the construction is that the machine is self-contained and can be moved to various parts of the shop and close to the bench, if desired, for more convenient work. The motor is built into the headstock and is totally enclosed. The armature is carefully balanced and runs in Gurney ball bearings. The ⅓-hp. General Electric motor runs at a constant speed of 3,400 r.p.m., which is a suitable speed for the class of work handled on a lathe of this size. A toggle switch is conveniently located on the motor, and lamp cord and plug are furnished for attaching to any convenient socket.

The capacity over the tool rest is 5 in. and the maximum capacity on

the face plate is 7 in. A distance of 24 in. is available between centers. The face plate is finished so that it also serves as a handwheel, and a spur center, interchangeable with other centers or chucks, is provided.

The bed is a single casting with an over-all length of 35 in. and the



WALLACE 6-INCH BENCH LATHE

ways are planed and ground on top and inner surfaces. A lever clamp holds the tailstock in position and the tail center is provided with the usual screw and handwheel and a suitable clamp.

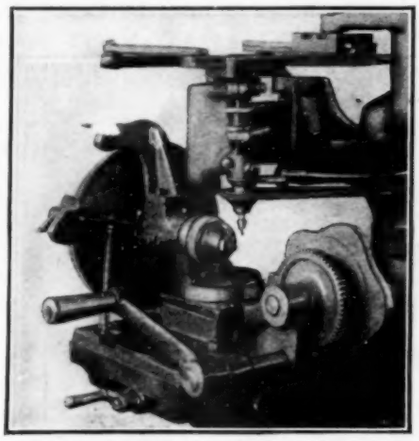
Two tool rests are provided, 6 and 12 in. long respectively. The rest and holder are easily adjusted and a locking device is provided on top of the holder. The base and subbase are box-shaped castings, designed so that the lathe will stand firmly without being too heavy to be portable.

The over-all height of the lathe is 47 in. and the length 40 in The net weight is 203 pounds.

Gorton Graduating Attachment

A graduating attachment for use with Gorton engraving machines or other similar machines has just been placed on the market by the Geo. Gorton Machine Co., Racine, Wis. The attachment consists of a cast-iron base on which is located a sliding head, the head being propelled past the cutter by means of a cam mechanism. The work is held on a draw-bolt through the head, bushings being provided to accommodate any size hole in the work. Adjustment is provided for the dimension between the lines, and a knockout pawl operating in connection with a ratchet wheel provides for graduating sections of a circle. The head swivels and is graduated so that the cutter can operate on surfaces at any angle up to 90 degrees.

The work is fed past the cutter by means of a cam that contacts with a roller which is attached to the head, the roller being kept in contact with the cam by means of a heavy coil spring under the base of the attachment. The cam is revolved through a gear and pinion by means of a hand crank on the pinion shaft. The lengths of the lines are determined



GORTON GRADUATING ATTACHMENT

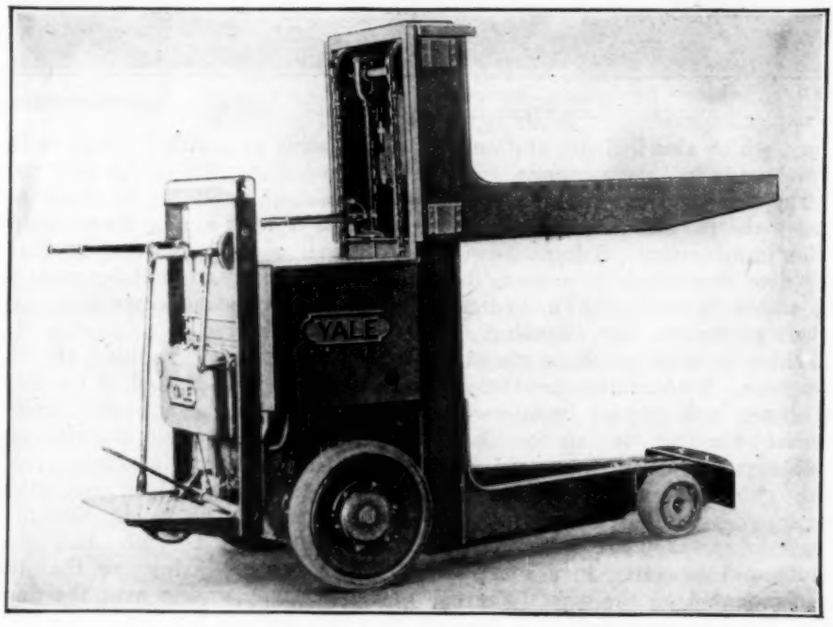
by the heights of the cam points, and as many points are required as there are variations in the lengths of the lines desired. The cam shown on the attachment in the illustration has five points, four points of the same height and one higher than the rest, thus producing four lines of equal length and a fifth line that is longer than the others. The ratchet wheel is also easily changed and wheels having any desired number of divisions can be supplied with the attachment.

Yale Model K-22 Elevating Platform Truck

The Yale & Towne Manufacturing Co., Stamford, Conn., is now marketing an elevating platform truck which has been designated the Yale Model K-22. This truck combines the advantages of a self-loading transportation unit with the ability to do high lifting, stacking or tiering.

The main longitudinal frame is made in one piece of pressed steel and the stability of the truck is increased by keeping the center of gravity as low as possible. The lifting mechanism is of the triple spur-geared reduction type, electrically driven. Simple and safe operation is insured through electrical braking with mechanical auxiliary lowering-speed control, and automatic upper and lower limit stops. The steel chain and sheaves are heat-treated.

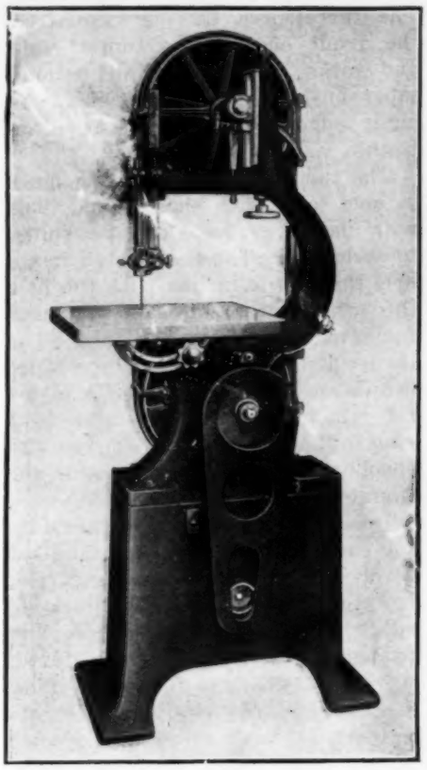
The spur-gear unit power axle used on other trucks of this series is used on this truck and the control is of the standard type. The majority of the individual parts and subassemblies are interchangeable with other models of the series.



YALE MODEL K-22 ELEVATING PLATFORM TRUCK

Bauer & Pease Band Sawing Machine

A band sawing machine for use in pattern shops and other woodworking shops has been placed on the market by Bauer & Pease, 314 Douglas St., N. W., Grand Rapids, Mich. The machine is of the usual vertical construction and is intended for use in sawing any kind of wood parts within the capacity of the machine, which is 16 inches.



BAUER & PEASE BAND SAWING MACHINE

The base and column of the machine are of cast iron, cored and machined. The wheels and table are also of cast iron, the wheels being machined, balanced and rubber-faced. The wheels are 16 in. in diam., and run at a speed of 750 r.p.m. The table is 18x20 in. and is so arranged that it can be tilted to any angle up to 45 deg., and locked in the desired position. The rocker on which the table is mounted is built into the column of the machine, so that the table can be held rigidly. All journals run in ball bearings and an anti-friction guide is provided for the saw. The maximum dimension under the guide is 7½ inches.

Power is supplied to the machine through a ½-hp., 110- or 220-volt motor, mounted on a swinging frame within the base of the machine. An endless belt is provided and covered with a guard and the motor is completely protected from dirt or shavings. Aluminum guards are also provided for the band wheels and saw. The machine is entirely self-contained and is provided with casters, so that it can be moved about to suit the work. The floor space required is 18x30 in., and the weight of the machine complete with motor is 350 pounds.

Yale Industrial Truck

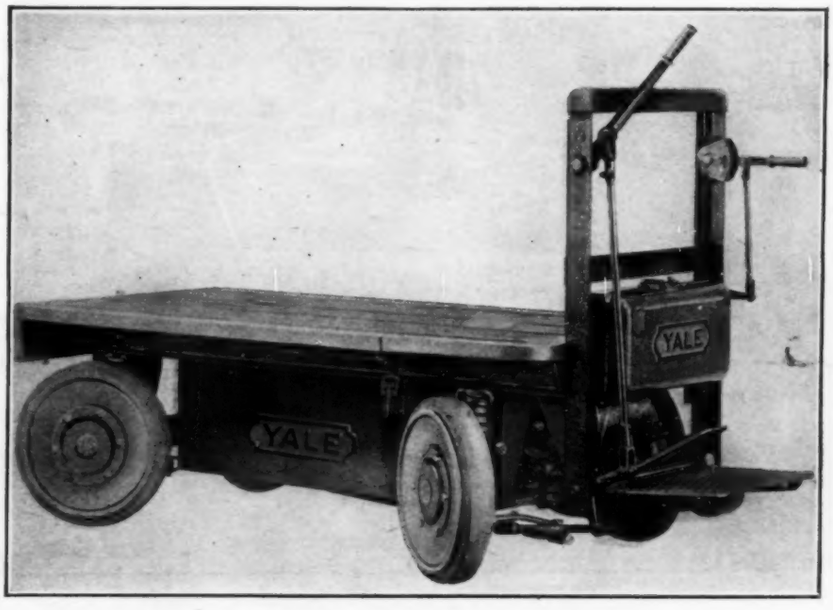
The Yale & Towne Manufacturing Co., Stamford, Conn., is now marketing an industrial truck designated as the Yale Model K-20, which is designed to meet the general requirements of intraplant material movement.

A feature of the design is that the majority of single parts and unit assemblies are standard and interchangeable with all other models of this series of Yale trucks. This is terchangeability leads to economies in truck operation and advantages in operation when several trucks are used in one plant.

The wheels are large and a full spring suspension permits operation over rough surfaces. The truck is driven by the standard spur gear unit power axle, in which heat-treated steel and ball bearings protected from dirt and properly lubricated, are used. The standard Yale controller is installed.

In the manufacture of this truck the effort has been to decrease the number of parts, place them in accessible positions, and group them in self-contained major units.

Auxiliary equipment available includes a gravity dump body for handling loose material and an electrically operated swinging boom crane.



YALE INDUSTRIAL TRUCK

"Macalene" Fluid for Hardening Cast Iron

A liquid hardening agent for cast iron is now being marketed by the Macalene Co., Saint Cloud, Minn. The material is known as "Macalene."

For use the fluid is mixed with a suitable quenching oil. If medium hardness is required, the mixture is made with one part of the fluid to 100 parts of oil, and for extreme hardness the ratio is 50 to 75 parts of oil to one part fluid. The metal is heated to a red heat, below the scaling point, and immediately quenched in the solution.

It is stated that the hardness of the metal depends on its temperature and the strength of the solution, so that various degrees of hardness and hardening of parts of a casting can be obtained by proper use of these elements. By reheating a treated casting and allowing it to cool in air the metal may be returned to its original soft state. It is claimed that castings treated with this material will measure 450 on the Brinnel hardness scale and that they resemble high-carbon steel in general properties. The fluid may also be mixed with water but the use of oil is preferred.

Bardons & Oliver Turret Lathe

A recent addition to the line of tools manufactured by Bardons & Oliver, Cleveland, Ohio, consists of a new series of turret lathes which are particularly adapted for machining brass, iron and aluminum or any material that is worked dry. These lathes are built in various sizes, and the 15 x 8-in. lathe with friction-geared head is shown in Fig. 1.

It will be noted from the illustration that the head and bed are cast in one piece, and the leg under the head end is given an exceptional spread on the floor, in an endeavor to reduce vibration. The legs are attached to the bed in such a way that the bed has a three-point bearing. The head is semi-enclosed and is furnished plain or friction-geared as desired. The friction-geared head cone has the same width of face as the plain head cone, and the clutch mechanism is operated by a convenient handle at the front. The friction cones are adjustable for wear by ring nuts on the spindle outside the cone and easily accessible. A set of springs insures quick release of the clutch, and the back gears can be thrown out when continuous operation on open belt is desired.

The spindle is forged from high carbon steel and ground to size. The spindle nose has an external thread and two straight bearings at either end of the thread for holding chucks, face plates, etc., squarely on the end of the spindle. Special noses will be made if desired.

Screw or lever cross feed for the cut-off rest slide is furnished at the option of the customer. The cross motion is regulated by accessible stop screws at front and rear and

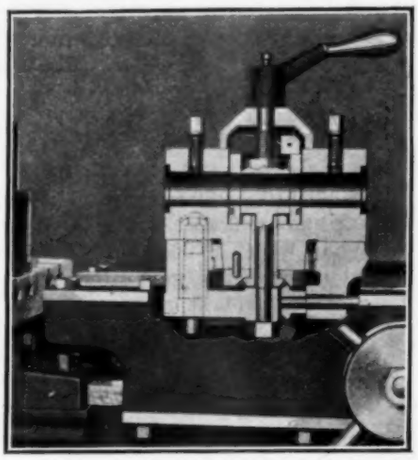


FIG. 2—BARDONS & OLIVER TURRET ARRANGEMENT

the screw feed is provided with a micrometer dial in addition. Longitudinal adjustment is effected through a micrometer dial, and the saddle is guided entirely by the front way, which is made sufficiently wide. Cut-off tool posts in four styles, plain round, round with base, square and open side, are offered at the option of the purchaser.

The hexagonal turret is mounted on a turret slide which has longitudinal motion only, and the turret is revolved automatically by the backward movement of the slide. The turret slide bearing extends beyond the front end of the saddle, thereby supporting the slide through practically all of the usual working travel, and permitting the bearing to be brought close to the cut-off slide. The turret lock bolt is located in the front end of the turret slide and works into hardened and ground taper bushings, located as near the outer edge of the turret as practicable, as shown in Fig. 2.

The turret is provided with holes to hold tools with shanks, and tools with flange or base can be bolted to each face. The turret stud has a hole through it in line with the hole through the spindle and is used for clamping the turret only. The thrust of the cut is taken by a taper projection on the bottom of the turret which fits an adjustable split ring in the turret slide. The nut and spool in the turret center holds the turret on its seat on the slide.

Independent stops are provided for each face of the turret and the revolving type of stop screw carrier is used. An automatic chuck of special design, and arranged to allow for slight variations in diameter of work to be held, is furnished if desired. Machines equipped with the automatic chuck are regularly furnished with chuck hood and collet for one size of bar stock. Other sizes of collets can be furnished, including the hinged extra capacity type.

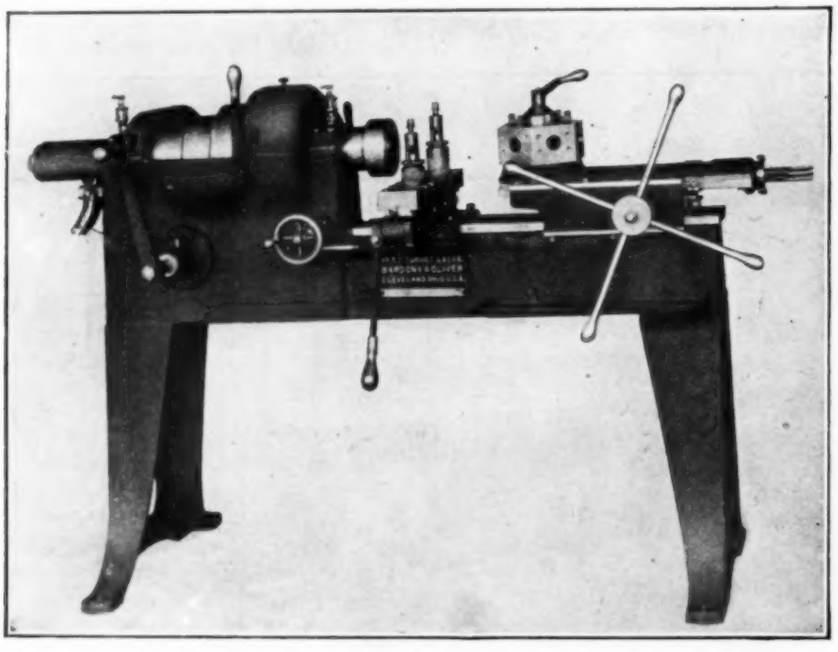


FIG. 1—BARDONS & OLIVER TURRET LATHE

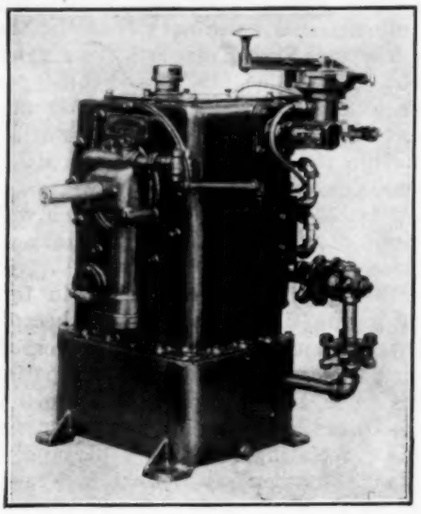
Oilgear Type W Pump

A pump designed especially for hydraulic presses and similar service has been recently placed on the market by the Oilgear Co., 60 27th St., Milwaukee, Wis. This is a compact variable delivery pump and is designated as the "Type W." The design and construction of the essential parts of the pump are similar to those of like equipment manufactured by this company and described on pages 271 and 395, Vol. 55, of the *American Machinist*.

The type W pump differs from the previous pumps in the assembly of plungers and crossheads, since the plungers are now closely coupled to the crossheads. In this way a suction action is provided which makes it unnecessary to depend on a large auxiliary gear pump. The type W has a small gear pump to keep the

running parts well lubricated and to operate the control cylinder.

The hydraulic control for regulating the stroke of the main pump consists of a double-acting hydraulic cylinder and a piston which is attached to the stroke-changing arm by a cross yoke and two links. These are so arranged that a heavy spring holds the pins at all times against one side of their bearings in the links, cross yoke and arm, thereby preventing any play in the joints. Oil pressure to the control cylinder is regulated by a small balanced piston valve that admits oil to one end of the cylinder and at the same time allows it to flow from the opposite



OILGEAR TYPE W PUMP

end. This construction provides a hydraulic dashpot which holds the arm rigid in any position.

The oil is delivered from the ports through the passages in the main pintle down through one of the two passages provided in the casting which forms the arm on which the pump unit rotates. When oil is flowing down through one passage it is being drawn up through the other. The direction of flow in these passages depends on the direction of flow of oil from the pump. The oil passages in the arm communicate with suitable passages in the lower pintle and these in turn with the delivery and intake pipes. An automatic two-way valve insures the proper direction of flow of oil to and from the pump.

The amount of oil delivered to the press cylinder is controlled by means of a single handle or lever attached to the stroke-changing mechanism through a hydraulically operated control cylinder. It is stated that the flow of oil is steady and free from pulsations; that the pump responds instantly and smoothly to the operation of the control handle; and that this instantaneous response applies both to varying the amount of oil delivered and to reversing the direction of delivery.

The maximum capacity of the pump is 3,060 cu.in. per min. and the maximum working pressure is 1,000 lb. per sq. inch.

Madison Adjustable Taper Reamer

A tool for boring and reaming taper holes, known as the Madison adjustable taper reamer, has recently been placed on the market by the Madison Mfg. Co., Spring and Elton Sts., Muskegon, Mich.

The tool consists of a machine steel shank and a set of two taper cutter blades, locked together. The blades are of high-speed steel, carefully tempered, and are ground to the angle required to produce the desired taper. One of the blades is tapped and the other is slotted and counterbored for the head of a short screw, as shown at *A* in the illustration. This arrangement allows for an expansion of ¼ in. on the one-inch blades, the adjustment obtainable on the larger sizes corresponding to the size of the blade. The cutters can

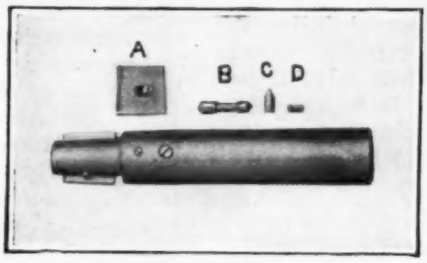


FIG. 1—MADISON ADJUSTABLE TAPER REAMER

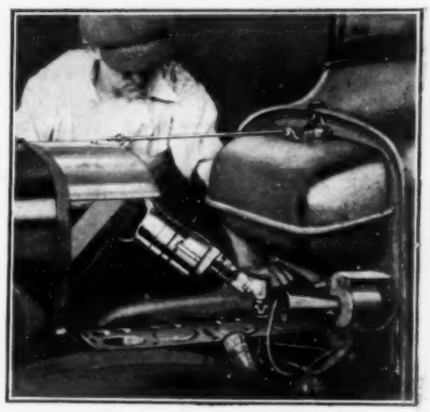
be locked in the slot by means of the pin *B*, which is located back of the cutter-slot. The front end of the pin enters a recess in the rear of the cutter, and the rear end of the pin is tapered to correspond with the taper on the lower end of the set screw *C*. Screwing the set screw *C* into the shank forces the pin *B* ahead into the recess in the rear of the cutter and regulates the amount of float, or locks the cutter in place, as desired. When set for floating, the cutter cannot fall out of the shank. The small set screw *D* locks the pin in position after being set. The cutter should be allowed to float on the finishing cut, thereby taking care of any misalignment in the machine spindle.

Petersen "Double-Action" Valve Grinder

A valve grinder which imparts a combined rotary and oscillating motion to the valve has recently been placed on the market by the A. H. Petersen Mfg. Co., Milwaukee, Wis.

The combined motion is produced by a special gear arrangement which duplicates the motion obtained by experts using hand-operated tools. The machine is light and compact and an offset attachment is furnished which permits access to all valves. The accompanying illustration shows the grinder in use and fitted with the offset attachment.

All types of valves can be handled by means of the attachments furnished with the machine. Three lengths of driver spindles which slip into the chuck are provided and each



PETERSEN "DOUBLE-ACTION" VALVE GRINDER

spindle will take any of the various driver blades. The blades are designed for proper contact with various types of valves. For grinding Buick valves a special hook attachment is furnished, and for this work it is preferable to mount the grinder on a special bench base, holding the valve cage in the hand.

The motor of the machine will operate on a.c. or d.c. circuits and the chuck revolves at approximately 15 r.p.m., making 275 oscillations in the same time. It is claimed that valves can be ground more quickly and that results are better than with hand-operated tools.

The overall length of the tool is 12 in. and the weight is 6 lb. Pinions and shafts are made from alloy steel, heat treated, and bronze and ball-thrust bearings are used. The body is polished aluminum, and eight feet of rubber-covered attachment cord with a metal-capped separable plug are furnished.

Practical Trade "Missionary Work" in South America

"NOTWITHSTANDING the long and firmly established policy of the Bureau of Foreign and Domestic Commerce to refrain from predicting the course of future demand in foreign markets, we wish to suggest the likelihood of an early and substantial increase in the Argentine demand for United States brass products," states an editorial in *Commerce Reports*, published by the Department of Commerce.

"Within the next decade the men who are now learning the rudiments of modern industrial theory and practice at the Argentine National Industrial School in Buenos Aires will be taking their places in the mills, packing plants, power houses, refineries, and factories of Argentina, and assuming the duties and responsibilities invariably attached to the building of industries in a young country. Possibly in less than ten years the first effects of the teaching now being received by these young men will begin to be felt in national industry.

"If one man is now studying textile machinery with a British loom for a model, it is more than likely that later on, when he has become an engineer in a woolen mill he will show a certain preference for the type of loom from which he obtained his first knowledge of weaving. Another man who has studied internal-combustion engines with the aid of working models of an American gasoline motor will probably prefer such a motor to the makes of other countries when he is called on to specify in ordering motors for an Argentine factory. A third may become accustomed to a German lathe, a fourth to French instruments of precision, a fifth to a Belgian dynamo, and so on through the classes of the school.

"Price, exchange, deliveries, preferential duties, and a hundred other factors will enter every purchasing problem, but in a great many cases these other factors will balance, or nearly do so, and it is then that the early preference born of experience will, consciously or subconsciously, come into play and influence a decision favorable to the product ksown by the buyer.

WINNING GOOD-WILL

"An American brass company in Connecticut recently presented a large and complete set of its samples to the Escuela Industrial de la Nación at Buenos Aires, and, as a result, the men studying at the school—and the countless classes that will follow them—are now to know what American brass products are like. These samples will be examined, handled, weighed, and tested until they will have made an indelible impression (a first impression, probably) on the minds of the persons handling them.

"This idea of 'opening fire' on the potential engineer-buyer while he is still an undergraduate is not a new one. British and German firms have supplied such schools with catalogs, photographs, samples, models, and occasionally actual machinery and machine tools as a step in their gradual, systematic, efficient Latin American campaigning. There have undoubtedly been American firms far-sighted and clear-sighted enough to invest in similar 'long-time pulls,' but astonishingly few instances have come to the attention of the world-wide organization of the Department of Commerce.

"Too often American firms have subordinated the development of a permanent market to immediate sales, and too often American exporters have failed to fit their sales policy and methods to the buying psychology of the Latin American, which demands a gradual building of interest, desire, confidence, rather than a sales argument based primarily on attracting attention and stimulating action."

France as a Consumer and Producer of Machinery

Figures compiled by the Industrial Machinery Division of the Department of Commerce show that France has not been of outstanding importance as a machinery producer for foreign markets, though it has sold a good deal of such machinery abroad. Before the war French exports of industrial machinery varied from $19,165,000 to $41,495,000 in value, and 4.5 per cent to 6.6 per cent of the total international machinery trade of the world. Since the war the French exports have risen to as high as $52,000,000 in value (1920) and to 8.9 per cent of the world's total machinery trade (1919) and in 1920 and 1921 averaged 5½ per cent of the world's total. French machinery exports were valued at $47,063,000, last year.

As a consumer of machinery, in peace times as well as in war, the position of France is far higher than as a machinery producer and exporter.

Before the war the American participation in this trade was not very great. During the war it became very important, but subsequently has again decreased. This decline has in part been due to the participation of Germany in this trade, but as reports indicate that the German manufacturers have now lost the advantage given them by the depreciating mark it would appear that the time has arrived when sales effort in France can again be effective.

American manufacturers have a further advantage that owing to the extensive use of American equipment in France during the war there is a much better recognition of the merits of American designs than was the case formerly. Although it is true that the French tariff is a serious obstacle to the importation of such equipment, it also seems obvious that American manufacturers can secure a larger share of the orders for such equipment as must be imported. In this connection they should be careful to remember the requirements of the French colonies as well as those of France proper.

France is undergoing very important changes which will probably have a great influence upon both the import and the export machinery trade there for a number of years to come. For example, as a result of the Versailles treaty France secured in Alsace Lorraine and elsewhere, plant capacity for the production of 2 million tons of steel per year over and above that which she held in pre-war days. There appears to be reason for believing that in her own domestic market she will not be able to absorb this increased production, but that it will be necessary for the French to dispose of this 2,000,000 tons of steel per year in foreign markets.

This increased capacity will almost certainly require the use of more machinery in order that this steel may be handled in France, and correspondingly there are certain indications that part of this material will, in the future, be exported in the form of machinery.

News Section

Asks for Rigid Power Plant Legislation

A state license law for power plant stationary engineers and a more rigid boiler inspection law were advocated by Prof. A. W. Cole, of the steam engineering department of Purdue University in an address before the Scientech Club of Indianapolis recently, as a means of solving the problems created by the general inefficiency of power plants throughout the state.

In a recent inspection and investigation of power plants and the power plant situation in eleven cities of the state outside of Indianapolis, made under the direction of the engineering extension division of Purdue, Professor Cole said he had found evidence confirming the belief of the university engineering department that power plants generally were inefficient.

Boilers were being fired without consideration of the necessity of fuel conservation, and with power plant executives indifferent to the situation, he said.

"The executives seemed to believe that the trouble it would cause to rectify conditions to get the most utility wasn't worth the time or expense," said Prof. Cole. A similar attitude was apparent among engineers and firemen, he said.

Similar action has been advocated in many of the states and it is expected that some definite action will be taken to see that conditions in power plants generally are improved. Due to unprecedented production during the first six months of the year, it has been impossible to halt activity long enough to make changes, it is claimed.

Eight-Hour Day Assured By Judge Gary

Plans to abolish the twelve-hour day in the steel industry, adopted at a meeting of the directors of the American Iron and Steel Institute at the Metropolitan Club recently, will be pushed forward without unnecessary delay, said Judge Elbert H. Gary, president of the Institute, in a statement following the meeting.

The action taken by the Institute was the culmination of a series of conferences which began late in June after the late President Harding had asked the Institute to pledge that it would abolish the twelve-hour day when conditions of labor warranted that course. The President's request was made on June 18 and on June 27 the directors of the Institute wrote to the President saying they were determined to exert every effort at their command "to secure in the iron and steel industry of this country a total abolition of the twelve-hour day at the earliest time practicable."

Judge Gary's statement follows:

"Following the correspondence between President Harding and the Steel Institute, and as a result of the most painstaking investigation, manufacturers of iron and steel, representing substantially the entire industry of this country, will now begin the total elimination of the twelve-hour day and will progress as rapidly as the supply of labor will permit. It is impossible to say when the changes will be completed. It will depend upon labor conditions at respective plants. There will be no unnecessary delay on the part of anyone.

"Where the hours of employees connected with continuous process are reduced from 12 to 8 hours, their wage rates will be so adjusted as to afford earnings equivalent to a 25 per cent increase in hourly and base rates.

"All other workmen will be on ten hours or less and their present hourly and base rates will be continued, but whenever it is practicable, by promotions or changes in position, the daily earnings will be accordingly adjusted."

Judge Gary has estimated that 60,000 additional men are needed in the steel mills to make the total elimination of the twelve-hour day possible. It is understood that approximately 25 per cent of the 260,000 employees of the United States Steel Corp. are working on the two-shift schedule of twelve hours each. Most of these employees are said to receive 40 cents an hour, or $4.80 for a twelve-hour day. A 25 per cent increase in wages will mean that these employees are to receive 50 cents an hour, or $4 for an eight-hour day. In actual wages they will lose 80 cents a day, but they will gain four hours of leisure.

Baldwin Plants Work at Capacity in July

The Philadelphia plants of the Baldwin Locomotive Works have been working at full capacity throughout most of July. Operations have steadily increased since the early months of the year, expansion being as rapid as development of working force would permit. Business booked during July was somewhat larger than in June and President Vauclain looks for a continuation of this tendency. The company has on its books more than $50,000,000 of unfinished business, or enough to occupy its full capacity for the rest of the year.

Plan Safety Campaign

An intensive safety campaign is to be conducted among the industrial plants of Baltimore by the Baltimore Safety Council. Paul F. Stricker, director of the council, is lining up the plants preparatory to beginning the drive. One of the features of the campaign will be schools of instruction conducted for superintendents, foremen and master mechanics connected with the industrial plants. In addition to this it is planned to hold monthly meetings of engineers and supervisors of safety in industrial plants when they will be addressed by prominent speakers on industrial safety.

Iron Output in Foreign Countries

An estimate of the stock of steel materials in Japan at the end of May, 1923, with comparative figures for the end of April in parentheses, made by the Mitsui Bussan Kaisha, a large commercial firm is quoted in a report to the Department of Commerce as follows: Bars, 36,534 long tons (25,797); plates and sheets, 34,913 (31,545); shapes, 14,262 (13,065); galvanized sheets, 12,326 (13,577); tinplate, 4,493 (4,488); nails, 622 (4,018); wire, 9,920 (8,455); rails, 8,458 (3,526); and other products, 4,761 tons (2,492 tons).

Current reports from Czecho-slovakia received by the Department of Commerce, indicate no important change in the activity of the local iron and steel mills which are continuing to operate around 45 per cent of capacity as for two or three months past, with production on a basis of approximately 850,000 metric tons of steel annually. Of this quantity about 25 per cent is used in the domestic market and the remainder is exported, to Germany in particular. Orders for export are declining and prices, while still unchanged, are showing a soft tendency. It is estimated that orders now on hand will keep the mills occupied until next August.

The Mining, Iron and Machine Association reports that the iron and steel production in Austria for the first quarter of 1923 was as follows: Open hearth pig iron, 71,212 metric tons; foundry pig iron, 21,479 tons; Bessemer steel, 11 tons; Martin steel, 84,520 tons; puddled iron, 87 tons; puddled steel, 187 tons; refined steel, 7,753 tons; finished products—iron bars, 20,811 tons; steel bars, 9,333 tons; girders, 2,958 tons; rails, 5,003 tons; sheet iron, 1,021 tons; sheet steel, 694 tons; and rolled wire, 17,409 tons.

The total production of the mining industry of the Santiago de Cuba consular district in 1922 was 468,340 tons of iron ore (hematite and magnetite) and about 20,000 long tons of manganese ore containing about 30 per cent manganese, from which 4,100 tons of concentrated product were obtained.

Iron and Steel Imports

Imports of iron and steel into the United States for the first half of 1923 totaled 515,805 long tons, an extraordinary amount when one considers that only 125,000 tons, approximately, entered the country in the corresponding period of 1922. It must be remembered in this connection, however, says the Iron and Steel Division of the Department of Commerce, that the boom in iron and steel importation did not begin until the second half of 1922. The past few months have seen a decline in the phenominal importation of pig iron, so that iron and steel imports for June, 1923, amounting to 68,019 tons, are but 12 per cent above the monthly average for last year according to the report.

Satisfactory Business in Cincinnati

The machine tool houses in Cincinnati report that business is about normal for this time of the year. Some of them state that orders are rather scarce at present, but this is only to be expected when the mid-summer lull is taken into consideration. On the other hand there are several large houses that have orders sufficient to keep them running on a normal schedule throughout the month of August. Judging by the slight increase in the amount of business being placed in the Cincinnati market by automotive manufacturers there will be more activity from this source during the next few weeks, although buying in volume by the automotive trades is not expected to begin until next month. Purchases of machine tools by this industry have been rather quiet for the past two months.

One of the encouraging features of the past two weeks has been the receipt of several foreign orders of liberal proportions. A 36-in. lathe is being shipped by one local machine tool house to Brazil. This constitutes the first shipment to this South American country in several years. Another Cincinnati concern is also filling orders for machinery to be sent to England. Here again purchases have not been made for some time in the past.

Glass manufacturers and chemical plants have been doing some buying of machine tools lately. One of the large Cincinnati machine tool companies had the first order for conveying machinery placed with it since the war by a glass manufacturer. This in itself is encouraging as an indication of the trend of business toward expansion. Conveying machinery is enjoying a good business among local plants.

Gear Business Fair

Business on commercial gears is not as active as it has been, although production is fair. Inquiries have dropped off somewhat, but are expected to get better within the next month. Some local companies are buying bevel gearing machines. The Western Electric Co. has been in the market for several special machines.

Railroads are not very active in the purchase of machine tools at present. The Chicago, Burlington & Quincy R.R., and the Pennsylvania R.R. have been making inquiries locally, but have not actually made many purchases. Nickle plate manufacturers are in the market for planers and the American Can Co. is also in the market for equipment. A local gas machine construction company has recently placed a big order for machine tools with a Cincinnati house. Public utilities have been very quiet lately and have done little buying. It is expected that they will not resume purchases of any appreciable size until September.

Business on planers has been quiet with orders coming in in scattered amounts and inquiries but fair. Electric tool houses have been affected by the general falling off of business during the summer months. Milling machines are not in much demand at present.

The outlook for a good business in the Fall is bright. Cincinnati machine tool manufacturers are firmly of the opinion that there will be a healthy increase in their output and in the demand for machine tools with the advent of September and the resumption of operations on a larger scale by numerous industries. The volume of business to date this year has been much larger than in 1922 and the same percentage of increased orders is expected to hold throughout the year.

Railroads have been giving excellent service in delivering material during the past few weeks. All equipment turned out by local manufacturers of machine tools has been delivered on schedule time which is quite a contrast to the condition which existed only a short time ago.

Steel plants in this district are operating to about 75 per cent capacity, and might be able to increase this schedule if they could obtain certain skilled labor. There has been a diminution of new business, but orders are still of fair volume.

Kruttschnitt Speaks on Railroad Conditions

In the opinion of Julius Kruttschnitt, chairman of the Southern Pacific R.R., the year 1923 will stand out in the history of American transportation as marking the renewal of the old railroad pioneering spirit. Mr. Kruttschnitt in part said:

"The co-operation of the railroads with the Government during the period of Federal control and their attempt since to re-establish themselves in spite of enforced rate reductions, coming at a time when wages were on the climb, materials high and traffic irregular, have gradually convinced the public and the press that the chief aim of railroads, after all, is service.

"The strength of the arguments against the railroads has been removed by their performance to date. They have handled an unheard of increase in traffic without a car shortage and even have a surplus of cars. At the same time, in spite of lower rates, they are showing increases in net operating income.

"The Southern Pacific is in the middle of its best year. The net ton-mileage for June and for the first half year was 28 per cent higher than last year.

"Work on the Mexican extension of the road has proceeded satisfactorily. Tracks have been laid fifteen kilometres south of Tepic and there remains six kilometres to grade north of La Quemada before heavy construction in the mountain section can be undertaken. It will probably require from two and a half to three years to complete."

Western Electric Looks For Record Year

The Western Electric Co. expects this will be a record year in production, according to a statement by the company recently. Based upon production figures in hand, the cable departments have broken all previous records. The statement says:

"Thus far this year 11,572,265,000 ft. of copper wire, the communication conductor, have been used in the manufacture of telephone cable. It is estimated that the output for the year will be at least 22 per cent greater than that of 1922. The year's output of telephone receivers is at the rate of 1,750,000, or about 500,000 more than the plant turned out last year."

Bad Order Locomotives Increase

The Class I railroads of the United States had in need or repair on July 15, 11,855 locomotives, or 18.6 per cent of the total number on line. This was an increase of 405 over the total number on July 1, at which time there were 11,450, or 18 per cent.

Of the total number on July 15 last 10,784, or 16.9 per cent were in need of heavy repair. This was an increase of 458 over the number in need of such repair on July 1. There were also on July 15, 1,071 locomotives in need of light repair, which was a decrease of 53 under the number of such locomotives at the beginning of the month.

The railroads on July 15 had 2,437 locomotives in good repair and stored away to meet increased traffic demands later in the year. This was an increase of 256 over the number in storage on July 1.

During the first fifteen days in July 18,290 locomotives were repaired and turned out of the shops.

Good Business Reported By General Electric

The General Electric Co. reports that its bookings last month were larger than in the same month last year. This was despite price reductions in various products made this year. There was a decrease as compared with the preceding months, which averaged over $27,300,000 a month this year, but the electrical business normally faces a seasonal decline in July and August and the recent trade recession added to this somewhat. Officials of the company report that conditions with it are very good and that billings are running at a satisfactory rate.

The directors will meet about the middle of the month for dividend action. The usual quarterly declaration of 2 per cent cash payment and the regular yearly stock dividend of 5 per cent, payable in special ($10 par value) stock are expected.

More Bonds for General Electric Workers

Employees of the General Electric Co. have oversubscribed the first issue of $5,000,000 employee bonds offered by the company. A second issue of $2,500,000 has been announced by President Gerard Swope. The bonds are offered to employees with more than six months' service by the General Electric Employees' Securities Corp., to yield 6 per cent, plus a 2 per cent extra annual dividend.

The first offering was made on Feb. 8. It is believed the new issue will be sufficient to meet the needs of the employees, but if not preference will be given in the order of length of service. No employee is permitted to subscribe to more than $500 in bonds during a single year. Payment may be made in instalments from wages.

Will Buy Locomotives

Authority has been granted to the Elgin, Joliet & Eastern Railway Co. to obligate itself for the purchase of new equipment which is to include fifteen Mikado locomotives, to cost $867,283.35.

New York Enjoys Sudden Sales Revival

Business in the Metropolitan district improved with so much rapidity during the past week that dealers in some instances deferred their vacations until a later period and in one case a prominent dealer was suddenly called back to the city from his holiday by the press of business. Every dealer who was visited during the past week reported an improvement in his sales and also in the number of inquiries. "Better than at any time during the past eight weeks" and, "as good as we did during March and April" were two of the many declarations made.

General industrial buying seems to have been the cause of the sudden spurt in business. While railroads are still buying steadily and textile mills are in the market to a limited degree, the bulk of last week's business was with industrials in no particular line.

The New York Central R.R. is one of the roads that has bought regularly during the past month and indications are that it will continue to be a good customer for some time. Locomotive shops are steady patrons as well as all car shops and kindred lines.

Buying by the automobile shops in the Eastern territory is fair and heavier buying is expected within the next two weeks so that factories will be in the best possible condition for the Fall when it is predicted the record production of the Spring and early Summer will be resumed.

Special machinery is not being ordered to any extent at this time, according to those close to the market. The crane market is dull just now, but that, too, like other branches of the industry expects to see improvement before Sept. 1, when business takes on its normal aspect.

Dealers in used machinery report that sales are a trifle slow but blame the weather rather than any business cause. Garages have been good buyers of rebuilt and reconditioned machinery, it is reported.

Manufacturing plants in and around New York City are working near to capacity and there is no indication of a let-up in production. It is expected that there is enough business to carry most plants over until the Fall business starts.

Canadian Shops Prosper by Railroad Work

Successful flotation by the Dominion Government of $23,000,000 of equipment bonds for the Canadian National R.R. was the outstanding feature of the week ending July 28, as regards the outlook for future orders for railway materials. As Parliament has already appropriated seven millions for the same purpose there will be available for the purchase of locomotives, cars, rails and other equipment, the sum of thirty millions of dollars. The Canadian Pacific R.R. has also embarked upon an extensive plan for betterments and rolling stock, and in addition to orders already in process of filling, has contracted with the Algoma (Ontario) Steel Corp. for the supply of 30,000 tons of steel rails, an order which will keep that plant busy until the end of September.

The strike at the British Empire Steel Corp. works at Sydney, Nova Scotia, has practically collapsed, and the early resumption of output may be expected to influence the iron and steel market which was marked during the week by a drop of one dollar per hundred pounds in the price of pig iron.

In the field of larger engineering enterprises there is every indication of continued activity. Among the new undertakings announced during the week is a power project which will involve the outlay of over thirty million dollars and have considerable effect on the proposed St. Lawrence River power development. According to the application plan laid before the Federal Department of Railways and Canals in Ottawa, the scheme is backed by the National Hydro-Electric Co., Ltd., of Montreal. The proposal is to raise the level of the Carillon dam from 94 ft. to 133 ft.

Renewed interest in the movement to establish steel plants in British Columbia is arousing interest in eastern Canada, as at present the requirements of that province are largely met by importations from the United States. With the development of eastbound traffic in grain from Vancouver via the Panama canal, however, return tonnage at reasonable rates should stimulate larger importations from British sources of supply.

Seasonal Lull Is Felt in Philadelphia

A slackening in the unprecedented buying and manufacturing pace set in the Philadelphia district during the first six months of this year, has occurred. This is attributed to seasonal declines by manufacturing firms, and this theory is borne out by the monthly *Business Review* of the Third Federal Reserve district.

Machine tool manufacturers report the labor situation somewhat easier. There has been a considerable falling off in orders and there is an air of uncertainty among manufacturers as to the future.

The Federal Reserve district's review shows that, although steel is selling fairly well, the unfilled orders of the United States Steel Corp. have decreased. Many other steel companies, however, still have unfilled orders placed some time ago.

Several lines of building materials have felt the decline, and a falling off in building operations is reflected in the showing that the number of building permits has dropped and the value of the contemplated structures has decreased compared to this time a year ago.

That business men expect an active Fall trade is indicated in the freight movement of goods. Freight car loadings for June were far in excess of the normal loadings for this season. A large number of the cars loaded came from mills and shops of Philadelphia manufacturers.

The Federal Reserve report shows the average weekly earnings in the manufacturing industries declined in June from $26.71 to $26.26. It also shows there was an increase in employment, which, taken with the decrease in weekly earnings, indicates an easier labor situation.

Manufacturers of plumbing supplies report that the falling off in orders is attributable to the fact that jobbers bought heavily during the year and are now selling from stock.

Railroads Still Buying in Chicago

The machine tool market in the Chicago district was less active in July than in June and the market is experiencing the mid-summer lull, both inquiries and orders having fallen off. The tendency seems to be to defer purchases until the latter part of the year in the belief that decreased buying will result in purchasing to a better advantage in the Fall than at present.

While the machine tool industry made a good showing during the first half of the year, it is suggested that a greater portion of this purchasing was for replacement and that there was very little buying for purposes of expansion. However, recent inquiries indicate that some consideration is being given to purchases for new projects and expansion. The railroads continue to buy machine tools although not near as heavily as during the early part of the year.

The hot wave, which has made itself felt generally, is affecting consumption of iron and steel. Foundries, which otherwise would be running full are taking only a few heats a week to give their men a little vacation. In spite of this there has been a fair amount of buying for prompt and last half delivery. While small lots continue to be in the majority, a number of buyers, by placing orders for impressive tonnages for shipment throughout the balance of the year, are backing their judgment that the market has about reached the bottom of the present price dip. Chicago mills are in a comfortable position for at least the next two or three months and they anticipate no difficulty in obtaining sufficient tonnage to carry them through the last quarter of the year.

Indiana Business Shows Improvement

The last two weeks have seen some improvement in both the machinery and the machine tool business. The increase has been slight, it is true, but coming as it does during an ordinarily slack time in the business, it would indicate more business for this Fall.

In the first place some activity is to be seen among the automotive factories here and their allied industries. They are buying more tools and inquiries are being received from purchasing agents for specialized machinery, which indicates some fair sized installations during the next few weeks. Manufacturers say the public trend—particularly noticeable this Fall—toward the closed car, has made necessary the revising of their machine and tool departments to some extent. Farm machinery business is quiet, branch managers here say. The condition of the farmer in view of present prices of grain and live stock, is deplorable, and he is buying no new machinery. During the last week developments in the financial affairs of the R. L. Dollings Co. of Indiana, a finance corporation that underwrote the stock issues of a number of industrials and went in the hands of a receiver, forcing some of the industrials to do likewise, have caused considerable worry.

Demand for saw milling machinery is curtailed, officials of E. C. Atkins & Co., state. The business has been excellent, however, for many months and they have no complaints to offer.

Aero Chamber Elects Its Officers

At the annual meeting of the Aeronautical Chamber of Commerce the following were elected to serve on the board of governors for the ensuing year:

Samuel S. Bradley, New York; Charles H. Colvin, Brooklyn; Donald Douglas, Santa Monica, Calif.; Sherman M. Fairchild, New York; Allan Jackson, Chicago, Ill.; E. A. Johnson, Dayton, Ohio; John M. Larsen, New York; Grover C. Loening, New York; F. B. Rentschler, Paterson, N. J.; Frank H. Russell, Garden City, N. Y.; Lawrence B. Sperry, Farmingdale, L. I.; B. D. Thomas, Ithaca, N. Y.; I. M. Uppercu, Keyport, N. J.; Jesse G. Vincent, Detroit, Mich.; and W. C. Young, Akron, Ohio.

Mr. Colvin is general manager of the Pioneer Instrument Co.; Mr. Douglas, president, the Douglas Co.; Mr. Fairchild, president, the Fairchild Aerial Camera Corp.; Mr. Johnson, the Johnson Airplane & Supply Co.; Mr. Jackson, vice-president, the Standard Oil Co. (Indiana); Mr. Larsen, president, the J. L. Aircraft Corp.; Mr. Loening, president, the Leoning Aeronautical Engineering Corp.; Mr. Rentschler, president, the Wright Aeronautical Corp.; Mr. Russell, vice-president, the Curtiss Aeroplane & Motor Corp.; Mr. Bradley, general manager, the Manufacturers Aircraft Association; Mr. Sperry, president, the Lawrence Sperry Aircraft Corp.; Mr. Thomas, chief engineer, the Thomas-Morse Aircraft Corp.; Mr. Uppercu, president, the Aeromarine Plane & Motor Co.; Mr. Vincent, vice-president, the Packard Motor Car Co.; Mr. Young, aeronautics manager, the Goodyear Tire & Rubber Co.

Immediately following the adjournment, the new board of governors met and elected the following officers:

President, Frank H. Russell; First Vive-President, Allan Jackson; Second Vice-President, S. M. Fairchild; Third Vice-President, Donald Douglas; Treasurer, Charles H. Colvin; General Manager and Assistant Treasurer, S. S. Bradley; Secretary, Luther K. Bell; and Assistant Secretary, Owen A. Shannon.

Fine Report by American Locomotive Company

The American Locomotive Co. in its report covering the six months ended June 30, 1923, shows gross earnings of $45,226,526, against $21,722,179 in the last six months of 1922. After allowing for all expenses, interest and taxes, there was reported profits available to the capital stock amounting to $6,972,125. After allowing for regular dividends on preferred stock, the balance available for the new 500,000 shares of common stock, without par value, was equal to $12.19 a share.

Andrew Fletcher, president, in a statement to stockholders, said that the inventory account of materials and supplies, contract work in process and stock locomotives and spare parts on hand June 30, 1923, amounted to $16,169,730. as compared with $15,337,873 on Dec. 31, 1922.

"The excess of current assets over current liabilities June 30, 1923, was $44,097,848 in comparison with $39,692,24_ on Dec. 31, 1922, an increase of $4,405,603," he said. "These amounts were obtained after including current liabilities, reserves for United States and Canadian income and profits taxes and reserves for current shrinkage in value of notes listed in current assets. The company on June 30, 1923, had no loans payable and had in its treasury on that date in cash and marketable securities $15,279,205, as compared with $15,078,202 on Dec. 31, 1922. The amount of unfilled business on hand June 30 is sufficient to keep the plants operating at full capacity for the remainder of the year."

Large Earnings Made By U. S. Steel

The statement of earnings of the United States Steel Corp. covering the second quarter of the current year, was the most favorable since the third quarter of 1920, when earnings were the largest of any period since the war. Net earnings totaled $47,858,181, against $34,780,069 in the first quarter of the year; $27,286,945 in the second quarter of last year; and $48,051,540, the record quarter of 1920. After all charges and deductions, there was reported a balance equal to $4.63 a share on the common capital stock outstanding.

Car Loadings Still at High Figure

A new high record for car loadings was established for the week of July 21 with a total of 1,028,927, according to the figures made public by the Car Service Division of the American Railway Association. This exceeds by 7,157 cars the previous record established for the week of June 30. It is also the seventh week this year in which the total loadings have exceeded the million mark. Barring the weeks containing holidays million-car loadings have been maintained consistently for the last nine weeks.

This record makes the third time this year that the highmark of 1,018,539 cars established on Oct. 14, 1920, has been exceeded. Loadings for the week of July 21 also exceeded the corresponding week of last year by 183,379 cars, and the corresponding week of 1921 by 240,893 cars. Compared with the previous week of this year it was an increase of 9,260 cars.

Loadings of merchandise and miscellaneous products, which slumped during the first two weeks of July, increased 7,293, bringing the total for the week to 584,407 cars. Compared with the corresponding week of last year this was an increase of 28,665 cars, and with the corresponding week of 1921 it was an increase of 115,584 cars.

Record loadings for the year 1922 were 1,014,480 cars loaded in the week of Oct. 28, while the highest loadings this year were made during the week of June 30, when 1,021,770 cars were loaded.

Divided into groups the loadings for the week of July 21 indicated increases in grain, forest products, ore loadings and coke, and decreases in live stock and coal, when compared with the report of the previous week.

Live stock loading totaled 32,454 cars; 272 under the preceding week, but an increase of 5,073 over the corresponding week of 1922, while coal loadings were 190,788 cars, a decrease of 3,043, when compared with the week before.

Manufacturers Watching Coal Situation

"Almost overnight the possibility of a coal strike in the anthracite regions has taken on a threatening aspect," says the *Industrial News Survey*. "Apparently reliable reports indicate that the issue in controversy is the 'check-off' system, which is another way of saying the full and complete recognition of the union. The temper of the union representing the miners is indicated by the announcement of its officers that they stand irrevocably committed to collective bargaining, but are unalterably opposed to arbitration in any form. With a spirit of 'no compromise' on both sides, the public interest may again be sacrificed to the special interests of the operators and the miners.

"Industry and the public generally now look to the Federal Coal Commission for a practical interpretation of the dictum laid down in its recent report that 'if, as the Commission believes, the mining of coal is clothed with a public interest, then both sides must—peaceably and voluntarily if they will and under compulsion if they will not—deal with each other in the light of the general welfare of the American people.'

"In the face of those gloomy forebodings of labor difficulties, it is a pleasant task to record another step forward by a prominent employer in cementing the amicable relations which have for years existed between the company and its employees. This is the introduction of guaranteed all-year-round employment in a factory where the employees already enjoy insurance benefits, profit sharing and direct representation on the Board of Directors. The question at once arises, 'Why cannot some of these things be introduced into the coal industry?'"

Allis-Chalmers Sales Increased

The Allis-Chalmers Manufacturing Co. reports sales billed of $6,082,079 in the three months ended June 30, against $4,778,863 in the same period last year. Net profits for the period were $628,418, after expenses and taxes, equal to $1.30 a share on the common stock after allowing for preferred dividends. In the same period last year net profits were $299,796, equal to four cents a share on the common stock.

For the first six months of 1923 sales billed aggregated $11,303,762, against $9,450,465 in the first half of 1922. Net profits were $1,097,108, against $578,529, equal to $1.99 a share on the common stock in the first half of this year.

Wickwire Spencer Nearly Doubles Sales

The Wickwire Spencer Steel Corp. reports sales of $16,300,571 for the six months ended June 30, against $8,761,216 in the same period last year. Total income, after all expenses, and crediting other income, amounted to $2,008,080 against $929,166. After miscellaneous charges, but before depreciation and bond interest, there was reported net profit of $1,506,444 against $230,461 in 1922.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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PRESIDENT HARDING'S death was entirely unexpected. Early in the week his condition caused apprehension, but his recovery seemed assured on Thursday morning and the news of his passing published on Friday morning was a great surprise. The whole nation is bereaved for Mr. Harding was a likable man whose humanity and broad sympathies had greatly endeared him to the American people.

It is, however, unlikely that his sudden death will have any effect upon business. He is the sixth president who has died in office and the Constitution provides so fully for such emergencies that there can be no disarrangement of the machinery of government.

As to Mr. Coolidge all that can now be said is that the business men of the country contemplate his succession with confidence and that his record justifies a belief in his conservatism and good sense. As Governor of Massachusetts he showed himself to be a strong and courageous man, careful of his words, but vigorous in action and no one doubts that as President he will give us a satisfactory administration.

Therefore the "mind of the market" is again turning toward Europe where the situation "seems" to be growing more chaotic. The word "seems" is used advisedly because no one can say in how far the published utterances of European statesmen are designed to affect sentiment rather than to describe facts. It is therefore quite possible that the gravity of the situation has been exaggerated.

But read literally the cables from London indicate that Great Britain will soon part company with France and Belgium in her negotiations with Germany; that Italy is likely to follow the British lead and that a practical dissolution of the Entente Alliance will follow.

As the otherwise unwarranted pessimism which some Americans feel is chiefly due to the fear of a political debacle in Europe a careful study of the facts and possibilities overseas is in order.

In such a study the first question that suggests itself is: Can war in the immediate or proximate future be the result of a break between Great Britain and France?

To this question nearly everyone will answer No. The British do not intend to fight. They are courageous, but they are also sane. Germany has neither arms nor the means for making them and the financial condition of France is such that she could not raise the money to pay for a war even if the men to fight it were obtainable, which is doubtful.

Admitting the utter improbability of war, the next two questions that suggest themselves are:

(1) How else can a way be found out of the present European *impassee;* and,

(2) If such a way out is not speedily found what will be the effect upon American business?

Answering the second question first it may be said that conditions in Europe are already so bad that they cannot get much worse and that since it is impossible for the economic level to fall below zero, we have not much to fear from a prolongation of the present uncertainty. We have Asia, Africa, South America, Holland, Scandinavia, Spain, Switzerland, Italy and the whole of the British Empire to trade with, and even if France and Germany insist upon committing commercial suicide, we shall not lose much for our business with them is already dwindling and their competitors will speedily take their places.

Therefore the 'mind of the market' is again turning toward Europe where the situation 'seems' to be growing more chaotic. The word 'seems' is used advisedly because no one can say in how far the public utterances of European statesmen are designed to affect sentiment rather than to describe facts. It is therefore quite possible that the gravity of the situation has been exaggerated."

It is in the answer to this second question that the way by which the present *impasse* will be ended is indicated. That way is the way that will be opened by the pressure of economic compulsion.

The German mark is already worthless and one of the consequences is that the German people are starving because their money will buy nothing. The inevitable result will be a change of Government in Germany either by revolution or otherwise and an offer to settle that France will have to accept.

If she refuses any reasonable proposal the franc which is already worth less than at any time previously will speedily follow the German mark to nothingness and leave the French people in a grave condition financially.

This somewhat extended examination of European conditions and eventualities has been attempted because it is chiefly by the fear of what may happen abroad that American enterprise and business are restrained today. Except for the President's death and the slight interruption that it may cause, the domestic outlook is about as impeccable as it ever gets to be.

Of the first essential to prosperity, bank credit, we are assured an abundance by a Federal Reserve ratio which stood at 77.3 per cent last Thursday. Railroad earnings are excellent and the traffic as indicated by the car loadings is the largest on record.

The retail stores nearly all report a gain in sales and the increase in the mail order business is phenomenal.

Seasonal fluctuations in the commodity markets have been recorded but, conditions are entirely normal and cotton has advanced sharply on a government report that was much below what has been expected.

Even wheat has been firmer and corn has advanced. But despite all this merchants are hyper-cautious and investors are scared because they fear that something that will destroy American prosperity may happen in Europe.

When we consider what happened in Europe from 1914 to 1919 and its effect upon this country this fear would seem to be unwarranted. It is in the hope of allaying this fear and re-inspiring the faith in ourselves and civilization that has made us prosperous in the past that the foregoing has been written. Our government is functioning perfectly in the emergency caused by the death of its beloved chief magistrate. Our economic position is entirely sound and the will to develop the opportunities it offers is the only thing needed to assure national prosperity and happiness.

Inland Steel Reports Good Profit

The Inland Steel Co., for the six months ended June 30, 1923, reports net profits, after all expenses, of $3,530,493. Net income, after depreciation and taxes, amounted to $2,459,635, from which common and preferred dividends were paid, leaving a surplus of $1,291,821.

The board of directors declared the regular dividend of 62½ cents a share on the common stock and the regular dividend of 1¾ per cent on the preferred stock. The common dividend is payable Sept. 1 to stockholders of record Aug. 15, and the preferred dividend is payable Oct. 1 to stockholders of record Sept. 15.

New Westinghouse Plant Nears Completion

Rapid progress is being made at the Sharon, Pa., plant of the Westinghouse Electric & Manufacturing Co. to get it ready for making transformers. The company has closed contracts for much of the machinery and tools needed for the work, and is making an effort to begin operations about Oct. 1. About 1,000 men will be employed when the plant starts, but eventually the number will be increased to 3,000 it is stated.

Increase in Trade with South America

A remarkable increase in the trade of the United States with South America for the fiscal year ending June 30, 1923, compared with the similar period of 1921-22, is shown in figures issued recently by Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce. Total trade—exports and imports—amounted to $739,427,154 this year against $479,710,139 last year—showing an increase of 55 per cent.

According to Director Klein, the figures demonstrate impressively certain facts which have become increasingly evident in our Latin American commerce. European competition in those markets, in spite of advantages through depreciated currency quotations, is making no serious inroads upon our position. The power of invested capital as a determinant of trade currents is clearly indicated; our heavy investments, through American loans and new enterprises, have emphatically proved to Latin America the confidence of our bankers and merchants in her economic future. They have also stimulated the shipment of American equipment—electrical machinery, telephone apparatus, railway supplies, etc., for these new undertakings. Our increased imports are, of course, an indication both of settlement of interest charges on these loans and of the great demands for raw materials for the expanding of all kinds of industry of this country.

Both exports and imports shared in this gratifying showing, according to Director Klein. Exports to South America increased 35 per cent, or from $190,812,070 in 1922 to $258,684,390 in 1923. An even more startling increase is noticed in our imports from that region. Our purchases this year amounted to $470,842,764, as compared with $288,897,069 during 1921-22, which is a jump of 63 per cent. The percentage of increase in total trade with South America was greater than with any other trade region excepting Oceania.

Train Control System Proves Successful

"Extremely encouraging results" were reported by the Train Control Committee of the Pensylvania R.R. following a year's trial under practical operating conditions of a new automatic control system on a fifty-mile stretch of track on the tracks between Lewiston Junction and Sunbury, Pa.

The system had been in operation throughout the entire Lewiston branch since July 11, officials said, and the movements of all trains, freight and passenger, had been subject to its control. The control system is a combination of electrical, pneumatic and mechanical devices applied both to the track and to the locomotives. These devices automatically slow down, or, when required, bring to a complete stop, any train which approaches too closely to another on the same track, whether going in the same or opposite directions, or when switches are improperly left open.

Under the new control system the track is electrified to carry alternating current, and locomotives are equipped with electrical apparatus which, without actually touching the rail, picks up the current from the track by induction. The power thus derived performs two functions—operates cab signals, electric bulbs, three in number, and air brakes when trains are coming together, when proper speed might be exceeded, or when a train approaches an open switch. These functions are performed, according to the committee's report, "without any action being required on the part of the engineer or fireman."

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.034	$0.0263
Cold finished shafting.....	per lb....	0.0428	0.042	0.034
Brass rods.....	per lb....	0.1825	0.1825	0.1650
Solder (½ and ½)	per lb....	0.276	0.2862	0.228
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	46¼%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	63%

Railroads Preparing for Fall Traffic

In the August issue of *Commerce Monthly*, the National Bank of Commerce in New York states that unless unfavorable factors interpose, the continuation of present conditions of industrial prosperity throughout the country will go far toward assuring prosperity for the railroads.

"The improvement in the condition of the railroads of the United States which was apparent in the early months of last year, but which was prematurely strangled by the coal and rail strikes seems at last to have begun in real earnest. The ratio of operating expense of operating revenue has been gotten within reasonable bounds and business and industrial recovery has created a tremendous volume of traffic. Car loadings of revenue freight during the first six months of 1923 were nearly 12 per cent greater than in the same period of 1920. During the week of June 30 loadings were 3,000 cars above the record for a single week previously established in the Fall of 1920. The American Railway Association estimates that freight loadings during the Fall of 1923 will reach as high as 1,080,000 cars per week, more than 60,000 above any previous record.

"The outstanding factor in the situation is the comparative ease with which this extraordinarily large volume of traffic has been handled. Traffic congestion has been at a minimum and in spite of an unusually large percentage of bad-order cars and locomotives resulting from the strike of railroad shopmen last Summer the large shortage of freight cars which was a problem last Autumn has been pared down until at present a fair surplus exists. The proportion of locomotives in need of repair is being continually reduced."

Preparations have been made in anticipation of a heavy crop movement in the Fall which makes that season the heaviest traffic season of the year. Continuing the bank says:

"It is estimated that these precautions, and the receipt of the large number of freight cars on order to be delivered Oct. 1 will enable the railroads to care for the enormous volume of traffic expected.

"The earnings of the railroads have kept pace with increasing car loadings. Their gross operating revenues for the first five months of 1923 amounted to over $3,550,000,000 more than 13 per cent higher than the previous record for the period established in 1920. This was in spite of the fact that reductions in freight rates during the past year made voluntarily by the roads or at the instance of the Interstate Commerce Commission have in the aggregate been considerable. For the first five months of the year the average investment was 5.69 per cent. There is better than a fair possibility that the standard return of 5.75 per cent allowed the roads by the Act of 1920 will be earned this year for the first time.

"Economy of operation has not been at the expense of maintenance. In the first five months of 1923 a larger sum was expended for maintenance of way and structures and of equipment than in the corresponding period of any preceding year with the exception of 1920. Although the roads expect to spend in total more than a billion dollars during 1923 on equipment, improvements and developments, this amount will be capitalized rather than charged to operating expenses."

Ford's Railroad Shows Remarkable Gain

The Detroit, Toledo & Ironton R.R. again showed a remarkable earning statement for June. Despite the fact that the gross income of the railroad for June was only $874,559, against $904,632 in the same month of last year, the net operating income was $216,188, against $123,409 in the same month of last year, an increase of approximately 75 per cent.

The greatest saving was made in the operating expenses. The June statement even surpasses that of May, when the road earned $170,961, or $46,000 less than June. Estimates were made at that time that the road would earn a total of $1,500,000 this year, or more than the railroad originally cost Ford, it was said.

Personals

C. B. SHEPARD, formerly of the Shepard Art Metal Co., which was recently purchased by the Ternstedt Manufacturing Co., Detroit, has entered the business of automobile door handle manufacturing at 2900 Hart St., Detroit.

F. H. MURRY, formerly connected with the Detroit office of the New Britain Machine Co., New Britain, Conn., is now located in Chicago at 202 South State St., and will handle the firm's business in the Chicago territory.

JOHN MANGLE has been appointed Chicago representative for the Pure Carbon Co., Wellsville, N. Y. His headquarters will be at 184 West Washington St., Chicago.

H. L. ERLICHER, formerly assistant to the general purchasing agent of the General Electric Co., Schenectady, N. Y., has been appointed assistant general purchasing agent.

MAJOR R. W. CHANDLER, manager of the truck division of the Yale & Towne Manufacturing Co., Stamford, Conn., sailed recently for an extensive trip through England, France, Belgium, Denmark, Sweden, Norway and Holland. While abroad he will further the interest of his company, especially its electric storage battery industrial truck department.

A. E. THIFFAULT and RAYMOND I. CASPERS will have charge of the newly opened Chicago office of the Surplus Steel Exchange, Inc., New York. The office is located at 2257 Oakdale Ave., and will transact business for the states of Illinois, Minnesota, Wisconsin, Iowa, Missouri and Indiana.

J. H. CROSSLEY of the Metropolitan-Vickers Electrical Co., Manchester, England, is in the United States studying industrial heating developments which he hopes to apply to conditions in his own country

LOUIS R. KRUGER has resigned as mechanical engineer with the Chrobaltic Tool Co., Michigan City, Ind., and has accepted the position of general superintendent and mechanical engineer with the Cruver-Peters Co., Chicago.

H. J. EDWARDS has been appointed works manager of the B. F. Stearns Co., maker of the Stearns-Knight motor cars, Cleveland.

CHRISTOPHER J. MEYER, president of the Evinrude Motor Co. of Milwaukee, will sail from New York on Sept. 5 for Europe, to visit the branch factory at Munich, Germany, and for travel in France, Spain, Belgium, Denmark and the British Isles.

ALFRED KAUFFMANN, vice-president of the Link-Belt Co. and general manager of its Indianapolis plants, was elected a director of the Fletcher Savings & Trust Co., Indianapolis, recently.

GEORGE S. WINDERS has resigned as house manager and assistant-treasurer of the Van Camp Hardware & Iron Co., Indianapolis. HARRY C. BALLARD, formerly superintendent of the company, has been appointed to succeed Mr. Winders as house manager.

B. B. QUILLEN, president and general manager of the Cincinnati Planer Co., Cincinnati, is now on a business and pleasure trip to Alaska.

A. B. BREEZE, vice-president of the Cincinnati Ball Crank Co., Cincinnati, has tendered his resignation. His plans for the future have not been announced.

J. M. PFKORSE has been appointed superintendent of the Cincinnati Ball Crank Co. Mr. Pfkorse was formerly with the Wagner Electric Co. and the Borg & Beck Co.

BRIGADIER-GENERAL J. W. JOYES has been appointed Assistant Chief of Ordnance, succeeding to the vacancy created by the death of the late Brigadier-General William S. Peirce.

Obituary

AUGUST W. HOLLAND, aged 64 years, superintendent of the Graves & Marshall Boiler Works, Dayton, Ohio, died recently as the result of a stroke of paralysis. Mr. Holland had been with the company for the past 37 years, starting as a helper.

WILLIAM E. CANNING, superintendent of the Long Island R.R., aged 56 years, died recently at his home, Jamaica, L. I. He had been with the railroad since he was 15 years old.

A. H. JONES, head of the Jones Machinery Co., of Atlanta, Ga., distributors of machinery and supplies in the Southern field, died recently at his home in Atlanta at the age of 55 years. Mr. Jones was well known throughout the Southeast as an electrical engineer, serving for some time as superintendent of the Greensboro Electric Co., of Greensboro, N. C., before he came to Atlanta four years ago and established the Jones Machinery Co.

EDWARD VAN WINKLE, one of the pioneer machinery manufacturers of the Southern field, died the latter part of July at a private sanatorium in Atlanta, Ga., at the age of 82 years. He was formerly president of the Van Winkle Gin & Machinery Co., of Atlanta, Ga., extensive manufacturers of cotton mill and gin machinery and equipment, the name of the company being changed to the Murray Co. on Mr. Van Winkle's retirement some time ago. The business was established in Atlanta shortly after the Civil War.

HERBERT F. TOPP, head of Herbert F. Topp & Co., Cincinnati, pig iron dealers is dead. Mr. Topp was formerly connected with the Dayton Coal & Iron Co. and later became a partner in the New York firm of Crocker Brothers. Last January Mr. Topp left this firm to start the company which bears his name.

CAPT. ABONIJAH BRUSH ELLIOTT, civil war veteran and retired Chicago manufacturer, died recently at his home in Chicago at the age of 80 years. Capt. Elliott was born in Clayton, N. Y., on Feb. 27, 1843. He came to Chicago in 1890 and founded the firm of Jerome & Elliott, manufacturers of metallic packing.

R. L. MEIXELL, secretary of the Coats Machine Tool Co., New York, died recently at his home in that city.

Business Items

The Wisconsin Parts Co., Oshkosh, Wis., manufacturing axles for heavy duty vehicles, tractors and railroad coaches, has acquired the entire axle business of the Savage Arms Corp., Sharon, Pa., and Utica, N. Y. The purchase includes the entire inventory, dies, tools, patterns, patents and designs for front and rear axles. This will be consolidated with the Oshkosh works at once.

The Brainerd Foundry Co. has been organized at Brainerd, Minn., by E. O. Webb, Clyde E. Parker and Fred E. Kinsmiller, to manufacture gray iron castings. Construction work is now under way on a new foundry and cupola, to be ready to start operations about Oct. 1 or 15, it is reported.

Construction began early this month on the new $200,000 plant to be built at Jacksonville, Fla., by the Florida Machine & Foundry Works, F. G. Russell, Sr., head of the company, advising that the plant will comprise four units, and be the first in the state of Florida to produce steel castings. The equipment includes an electric furnace up to three tons capacity, which has been purchased from the Pittsburg Electric Furnace Corp. A separate building will house the company's machine shops, which will be equipped throughout with new machinery.

A Southern warehouse and general offices are to be opened in Atlanta, Ga., this month by the McKenna Brass & Manufacturing Co., Inc., of Pittsburgh, Pa., according to an announcement by E. C. Bastible, general sales manager. The Atlanta plant will be located at 483 Whitehall St., and will also do some manufacturing.

The Reliance Pump & Machine Co., recently incorporated, has taken over the three-story building at 120 South Calvert St., Baltimore, Md., and established a plant for the manufacture of an automobile pump, according to an announcement by the Industrial Bureau of the Board of Trade. C. Braxton Dallam is president of the new concern, and H. C. Dougall, secretary and treasurer.

The General Electric Co. announces the opening early this month of a general warehouse in Atlanta, Ga., the largest electrical warehouse and service station in the Southeast, with a capacity of 64,000 square feet of floor space. The Atlanta offices will handle the company's southeastern trade.

The annual convention of the sales organization of the Wolverine Brass Works, Grand Rapids, Mich., was held at the factory recently. L. A. Cornelius, president of the works, presided at all sessions.

The bureau of awards of the Brazilian Centennial Exposition has notified the Union Manufacturing Co., New Britain, Conn., that it has won the gold medal for the chucks exhibited recently.

The Hanna Stoker Co., Cincinnati, has moved into its new plant at Brotherton Road and the Pennsylvania R.R., Cincinnati. The new plant has production facilities of over $1,000,000 per annum.

Germany's Problem with Labor

Higher wages will mean higher prices for machine tools and less chance of selling in foreign countries—Manufacturers saved by labor's lack of strike funds

By Our Berlin Correspondent

THROUGH the adoption of sliding wages intended to stabilize the intrinsic value of wage payments business life enters into a new phase fraught with consequences, which are best signified by the almost desperate opposition which the machine building industry, in fact the industry in its entirety, had made since this scheme first loomed up several years ago. Up until now wages have been adjusted by tariff agreements concluded between the labor unions and employer's associations of the respective lines of industry for establishments within a certain district. Such agreements as a rule require lengthy negotiations usually ending in an appeal to the court of arbitration which again takes some time to find judgment.

In times of rapid shrinkage of the purchasing power of money such dilatory procedure makes a settlement obsolete before it has been accomplished. New claims are forthcoming before their predecessors are dealt with. The advantages of such protracted adjustments to the industry are obvious. It provides them with a time of grace during which wages are still paid at the old rates for some time after increases have been demanded. It is no rare occurrence that in such intervals wages drop to from 10 to 15 per cent of their pre-war equivalent. On the other hand, it has been the cause of continuous dissatisfaction in the labor element which, if the latter remained silent, has found expression in a lower rate of efficiency.

Although many manufacturers are inclined to recognize only the advantages of the present system, its disadvantages can hardly be overlooked, especially in times when conditions are so sharply pronounced that dissatisfaction assumes the extent of an unrest. Probably at no period during post-war time was the unrest caused by the wage question stronger than at the present. The comparative quietness is purely deceptive. Two important causes have kept the smouldering unrest under control, the consideration of the national plight and the fact that the strike funds of the unions have been seriously depleted by the rapid money depreciation. Had they been invested in securities of permanent value, the course of events would have been different and probably quite dramatic.

No Money for Strikes

As an illustration may be mentioned the recent strike of the Berlin metal workers, as the whole group of labor employed in the machine building and kindred industries is called. The German union of metal workers numbering over two million members could not support the 250,000 men concerned in Berlin in a strike of even short duration. The strike was declared against a specified number of works only with an aggregate complement of 80,000 men. The spreading of the strike beyond its planned confinements has brought it to a premature termination.

Local strikes that flared up in all parts of the country, were quenched for the reason mentioned. In many works the men have resorted to obstructionist tactics, impeding work by deliberate slackness. The rate of production dropped sharply, a serious item especially in respect to the output of basic products. The situation assumed a dangerous aspect and a number of increases granted in quick succession has failed to alleviate it.

Under such circumstances the conviction was growing and slowly maturing, assisted by a good deal of official persuasion brought to bear in the interest of the situation in the Ruhr that a stabilization of wages can no longer be prevented. The central organization of the German industry decided to agree to it on principle, but in the negotiations following considerable difficulties arose on the road to a practicable solution of the problem. A wide difference of opinion separated both parties to the contest. The agreement upon basic rates was a hard problem and still more so the key of progression.

> "The unions want no fixed basic rates, but demand that they be adjusted by agreement as heretofore. Moreover, they do not want them to be keyed to any gold basis but to the cost of living. By this settlement which may be transient in details, but doubtless is permanent in principle, the German manufacturers will be faced with an entirely new situation which in all its bearings can hardly be foreseen. It is clear that if wages are paid on a sliding scale, prices of coal, iron and steel that have been kept under control are bound to follow."

In the former respect the unions have made a very important concession, by admitting in principle, that in view of the state of efficiency in the works and the difficult marketing conditions the industry is unable to pay the pre-war equivalent of wages. The manufacturers' organizations were of the opinion that a bomb-proof arrangement should be built upon this concession, saving them from all anxiety with regard to foreign competition now and in the future. Their plan was to establish certain basic wage rates, which in consideration of the lower efficiency of labor and other elements in the labor situation, affecting cost of production should be well under the pre-war rates. This done, they would be willing to pay these wages even on an absolute gold basis, suggesting that the government should publish in short intervals an official rate of disparity, similarly as is done in the case of the import duty. This scheme, which the men themselves would doubtless gladly have accepted individually, allowing them as it does to compute their weekly income in advance with a certain amount of exactness has been violently opposed by the unions which were obviously in fear of becoming eliminated as a wage regulating factor.

The unions want no fixed basic rates, but demand that they be adjusted by agreement as heretofore. Moreover they do not want them to be keyed to any gold basis, but to the cost of living. This scheme the employers found inacceptable. They were open to concessions with regard to flexible basic rates, but not as regards the latter contention, fearing that the index of living cost might at times rise above the mark rate. This they maintained would surely happen in the event of an improvement of the mark rate, thereby counteracting its duration. An agreement on this point being out of the question for the present and times pressing a settlement of a temporary nature has been reached, which essentially leaves the methods of wage regulations unchanged, but introduces as a new factor the weekly adjustment of the rates prevailing to "changes in the value of the currency." The wording of this new clause in the official "directions for the adjustment of wages" just issued evidently leaves the question open and subject to further barter by which of the two scales, the gold standard or living cost the changes in the value of money will be measured. The temporary nature of this settlement is accentuated by the fact that it can be cancelled by fortnightly notice. In the case of a change in the basic rates such cancellation can even be demanded immediately. It is evidently in the mind of the contracting parties to set the scheme afloat somehow and form the ultimate decisions while moving along.

Higher Cost of Living

By this settlement which may be transient in details, but doubtless is permanent in principle, the German manufacturers will be faced with an entirely new situation, which in all its bearings can hardly be foreseen. It is clear that if wages are paid on a sliding scale, prices for coal, iron and steel that have been kept under control are bound to follow.

The time, when a rapid downslide of the mark rate reduced not only the cost of labor but created an extraordinarily cheap market for material, will not recur. The purchase of material will be lifted out of the realm of speculation, to a basis of comparative stability, which no doubt will cut deep into the extra gains of such manufacturers, who on the strength of ample means could squeeze every opportunity to the last drop of profit. Some confusion will reign at first on account of the multitude of scales employed in sliding prices from which doubtless a uniform scale must emerge which can only be the gold standard. This course of developments is commonly expected. In fact it is clearly indicated by past events.

The country has of late made large strides toward the gold standard under

the leading of a movement for the "preservation of substance." Certain industries, especially those strongly dependent on imported raw material have clandestinely adopted it. Public loans issued on a gold basis have been the signal to a more open practice. The only obstacle to general adoption is the resistance of the government exercised on behalf of control of wages and basic prices and of course also on behalf of the paper mark itself. Under the weight of sliding wages the barrier must break down, thereby throwing open the road to the gold standard.

The immediate effects of sliding wages upon machine building are depicted as follows: A good deal will depend on the ratio to pre-war wages that will result. Up until now, wages adjustments showed a clear tendency to employ a ratio of about 50 per cent of pre-war wages as a basic factor. The actual ratio has at times been considerably lower; at others, however, higher in correspondence with exchange fluctuations. The average of the last twelve months appears, on the strength of a superficial calculation to have been in the neighborhood of 30 per cent.

It is maintained that in view of the present output per head a wage ratio of 50 per cent to pre-war parity would equal pre-war cost of labor. With regard to material power and sundry expenses it is anticipated that their prices will in the future be regulated by the world market. At an assumed rate of 50 per cent of pre-war wages machine building industry would be working approximately under pre-war conditions as far as labor is concerned and at world market prices with regard to material. In respect to the personnel an adjustment similar to that introduced for manual labor is coming into force with the difference, however, that monthly salaries will be adjusted and paid semi-monthly.

Considering other largely increased items of overhead, the price of machinery will exceed pre-war prices by from 10 per cent to 30 per cent as diverging opinions will have it.

In view of the generally higher price level a sufficient margin would even then be left on the export market for certain lines of machine building, but in others, where prices have already largely overstepped pre-war prices like for instance, in the automobile industry, great difficulties will arise with regard to the export business.

On the domestic market, the existing import restrictions are considered sufficient protection for the present. The most serious side of the impending settlement is, no doubt, that it is expected to create permanent conditions for several years at least, from which there is no way back. It seems hardly possible that it can be changed before the mark rate itself is stabilized without causing a serious upheaval. Machine building lines which will feel the squeeze of stabilized wages will be compelled to look for compensation of higher cost elsewhere, that is to economy and labor saving a development which others, foremost among them the machine tool industry, are already waiting for with much expectancy.

Wage Earners Enjoying Prosperity

Contrary to general belief, the American wage earner in 1923 is better off than during the so-called "peak" period of 1920, according to conclusions reached by the National Industrial Conference Board as a result of researches into wages and the cost of living in plants employing more than 600,000 men.

As a result of its study the board finds that the "weighted" or comparative excess of rising wages over rising living costs was between 17 and 18 per cent greater in May, 1923, than in June, 1920, with the figure of the last prewar month, June, 1914, as a basis.

"For the last few months," according to a statement of the board, just issued, "wages have been rising. Many plants have announced increases of 10 per cent, 15 per cent and even more. How much of this is net gain to the wage earner, and how much merely compensates him for increased living costs, are important questions for consideration. In order to measure the effects of the fluctuations of the cost of living upon earnings, a figure known as 'real' earnings is developed by dividing the index number of hourly or weekly earnings by the index number of the cost of living.

"Thus by discounting the effect of fluctuations in the cost of living, the purchasing value of money earnings for different periods may be determined. The most recent compilation of data by the National Industrial Conference Board, comprising returns from plants employing more than 600,000 wage earners, bring out some interesting facts regarding real earnings.

"It is generally believed that at the peak of high wages in 1920 the wage earner was in a more advantageous position than he had occupied for a long time and more advantageous than he has occupied since that time. It is true that wages were at their highest levels in 1920, but the cost of living was also at that time high."

Employment Is Firm in New York State

No indications of serious dullness in industry have yet appeared in New York State and employment in manufacturing receded less than 1 per cent in July, according to the report of Industrial Commissioner Bernard L. Shientag, issued recently.

About half of the industry divisions in the State added to their forces this month and half of them let some of their workers go, he said. Most of the decreases were due to the usual Summer slackening, as in the glass and silverware and jewelry industries. An important decrease in the cotton and cotton finishing industries was due to dull business conditions. This industry has been operating night shifts until this month.

The important automobile industry showed a net reduction this month, although many of the plants added more employees. The steel mills were less active, but report good business in prospect for the third quarter.

The possibility of a decline in building has not yet reached serious proportions, partly, it was stated, because of the downward tendency in the price of materials. The industries making builders' supplies remain very active and the manufacture of railroad equipment continues its high level of employment.

The metal industries remain in about the same position as in recent months. Strikes caused reductions in the structural iron industry and in the manufacture of castings. The brass and copper industry was somewhat less active. Vacations accounted for the reduction in the cutlery establishments. Employment rose in the manufacture of cash registers and typewriters. The machinery factories remained active and those making electrical equipment added workers.

May Automotive Exports Show Decline

May did not show a clearly defined trend in automotive exports, although the total value of shipments of American automotive products—$17,092,041—represents a decrease of slightly over 3 per cent from the April total, according to *Commerce Reports* published by the Department of Commerce.

A decrease of slightly over 6 per cent in the number of passenger cars exported—the decrease in value was negligible—coincides with an increase in truck shipments of 14 per cent—the value of which, however, was slightly below the April figure.

In Canada the same tendencies were manifest—a decrease of over one-fifth on the number of cars exported as against truck exports almost one-third larger than in the previous month.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Centrifugal pumps for hydraulic mining. Santo Domingo, Dominican Republic. Purchase. Reference No. 7320.

The Commercial Indian Agency of Lahore, Punjab, India, is desirous of representing machine tool and machinery makers of America in India.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention. Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31. Hotel Astor, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron market stronger in several producing centers; inquiries show improvement. Slight price recessions, however, reported in Cincinnati, Philadelphia and Chicago, during week. Increased activity in steel plate demand. Tank and car construction, as usual, taking bulk of output. Plates and structurals holding firmly at $2.50 per 100 lb., Pittsburgh. Demand largely for immediate shipments; some makers getting above $2.50 for quick deliveries. Improvement in general tone of finished steel market.

Declines—Electrolytic copper down ⅛c. and tin, ¼c. per lb. in New York during week. Tin buying better despite price recessions; falling off in visible supply reported. Lead market quiet. Zinc down $1 per ton. Linseed-oil buying more active; price shading still evident. Chicago reports drop of 14c. per gal. in month.

Advance—Antimony stocks scarce; price rose ⅛c. per lb. in week. No other advances reported.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	28.77
Southern Ohio No. 2	28.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.76
Virginia No. 2	32.17
Basic	26.76
Grey Forge	26.76
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	¾ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	60	49½	¾ to 1¼	30	14
2 and 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, $\frac{5}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.00
Tin, 5-ton lots, New York			39.00
Lead (up to carlots), St. Louis	6.50	New York	6.75
Zinc (up to carlots), St. Louis	6.20	New York	6.65

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.00
Antimony (Chinese), ton spot	8.75	9.50	8.25
Copper sheets, base	24.50	23.50	23.00
Copper wire (l.c.l.)	17.25	20.75	16.25
Copper bars (l.c.l.)	22.00	24.00	19.50
Copper tubing (l.c.l.)	27.00	29.00	23.00
Brass sheets (l.c.l.)	19.75	29.25	18.75
Brass tubing (l.c.l.)	25.50	29.25	20.50
Brass rods (l. c. l.)	18.00	29.00	15.75
Brass wire (l. c. l.)	20.25	23.75	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	48.00	40.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	12.50
Copper, heavy, and wire	11.50	11.50	11.50
Copper, light, and bottoms	10.00	9.50	10.50
Lead, heavy	5.00	5.00	5.00
Lead, tea	4.00	4.00	3.75
Brass, heavy, yellow	7.50	....	7.50
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.00	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13¼x20¼, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.05	1.22	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅝ and smaller	60%	.....	....
Semi-finished nuts, ¾ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ¼ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1 50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 49	1 24	1.40
Cloth	3 38	2 67	3 20

New and Enlarged Shops

Machine Tools Wanted

Kan., Great Bend—Brown-Moffat Motor Co., 1205 Kansas Ave. (garage), J. F. Brown, Purch. Agt.—grinder for automobile cylinders.

Kan., Great Bend—J. H. Courtney (blacksmith)—large power steel drill press.

Kan., Great Bend—G. A. Duncan (garage)—power cylinder grinder (used).

Kan., Great Bend—G. Nash, 2537 Bway. (machine shop)—power drill press and power metal lathe (used preferred), also emery stand, belting, hangers, shafting and pulleys.

Kan., Hoisington—B. Whaelen (machine shop)—power metal lathe, power drill press, emery stand, belting, hangers, pulleys, shafting, belting and hand tools.

Kan., Hoisington—C. C. Whitecraft, (blacksmith)—power metal lathe, pipe threading machine, and power steam hammer.

Md., Baltimore—Baltimore & Ohio R.R.—24, 28 and 32 in. shapers, 44 in. vertical boring mill, 12 in. centering machine, electric 1 ton hoist, two 5 in. twist drill machines, 36 in. upright drill machine, one 20 in. x 10 ft. and two 36 in. x 18 ft. engine lathes, hack saw, three 24 in. x 12 ft. lathes, 20 in. drill press and two No. 1 grinding and polishing machines.

Md., Baltimore—C. W. Sylvester, Dir. of Vocational Training, Lafayette and Madison Aves.—lathes up to 18 in., boring machines, complete machine shop equipment, machines of small sizes, complete woodworking machinery of small sizes and all machinery and tools for use in vocational Depts. of Elementary and High Schools.

N. Y., Buffalo—C. A. Bliss, 249 14th St.—equipment for auto service station, also two 1,000 gal. gasoline tanks and pumps for proposed service station at 304 Hampshire St.

N. Y., Buffalo—Downing St. Garage, 80-90 South Park Ave.—auto service station equipment.

N. Y., Jamestown—Rathbun Mfg. Co., Inc., Rose Alley, (manufacturer of wireless outfits)—1 automatic screw machine No. 0, Brown & Sharp.

N. Y., Salamanca—F. Forness, Main St.—complete garage and service station equipment, to replace that which was recently destroyed by fire.

N. Y., Salamanca—J. E. Wells, Main St.—garage and service station equipment to replace that which was recently destroyed by fire.

Pa., Pittsburgh — Pennsylvania R.R., Pennsylvania Sta., W. R. Phelps, Purch. Agt.—14 engine lathes, crank planers, shapers, drill presses, drill grinders, wet tool grinders and radical drills for Altoona shops.

Pa., Sayre—Casper & Miner, Lockport St., J. Casper, Purch. Agt.—complete equipment for garage and service station.

W. Va., Huntington—A. C. Love Co.—one 25 to 30 in. swing lathe, with very short bed, 2 or 3 ft. between centers (used).

Wis., Livingston—Kemnitzer & Holmes, F. Kemnitzer, Purch. Agt.—auto repair machinery, drill press, chain hoist, storage tanks, pumps and small tools.

Wis., Racine—F. Applegate, 1043 Washington St.—auto repair machinery, drill press, pumps, tanks and small tools.

Que., Montreal—Castings & Supplies, Ltd., c/o C. R. McKensie, 792 Dorchester St. W.—equipment for manufacturing foundry and machine shop supplies.

Que., Montreal—A. Lacroix, 16 Bonsecours St.—lathe, drill and polishing machine.

Que., Shawinigan Falls—Garage Universal Co., Ltd., Place du Marche—equipment for automobile repair shop.

Que., Three Rivers—C. E. Marchand, 13 St. Marguerite St.—garage and repair shop equipment.

Machinery Wanted

Kan., Great Bend—Great Bend Hardware & Implement Co., (tin shop) J. Whitney, Purch. Agt.—tinners brake.

Kan., Great Bend—Morrison Constr. Co., (planing mill)—power sander.

Kan., Hoisington — Hoisington Dispatch, (newspaper and job printing)—power metal saw and trimmer, (used preferred).

Kan., Wichita—Wichita Publishing Co., 333 North Market St.—D. A. Resing, Purch. Agt.—power magazine press, power paper cutter, linotype, belting, hangers, bearings, pulleys and shafting.

Ky., Louisville—U. S. Engineer, P. O. Box 72—machine supplies including 120 high speed drills, hoist, Morse taper shank (various sizes), 15 brass castings, 2 steel ratchet wheels, 1,000 ft. 1¼ and 1⅜ in. wire rope, and 100 ft. 1 in. dredge chain.

Ky., Louisville—United States Foil Co., 2934 Grand Ave.—foundry equipment for new proposed $20,000 foundry.

Mo., Kansas City—Midwest Electric Welding Co., 112 East 18th St.—portable crane, capacity 6,000 lb., not over 8 ft.

N. Y., Bolivar—Forness Oil Co., Inc., (oil drillers)—E. W. Cady, Purch. Agt.—oil drilling outfits and machinery.

N. Y., Buffalo—L. L. Humig, 268 Virginia St.—equipment for small bakery at 2149 Fillmore Ave.

N. Y., Buffalo—M. Maday, 1760 Genesee St.—equipment for wagon works.

N. Y., Niagara Falls—J. Mullane, Erie Ave. (gasoline and supply station)—2,000 gal. gasoline tank and station equipment.

N. Y., Niagara Falls—O. Rich, Riverway and Niagara Sts., (gasoline stations and auto supplies)—1,500 gal gasoline tank; also equipment.

N. Y., Olean — The Pennsylvania R.R., E. P. Huston, Master Mechanic — motor driven ash handling equipment to replace that which was destroyed by fire.

N. Y., Salamanca—Wright & Moore (grist mill)—A. Wright, Purch. Agt.—complete equipment for new grist mill.

N. C., Greensboro — Carolina Steel & Iron Co.—one 1¼ in. cap. electric drill for heavy work, not to exceed 50 or 60 lbs. in weight.

N. C., Hickory—Yeager Mfg. Co., (manufacturer of dining room furniture), M. Yeager, Secy. and Treas.—double trim saw, (good condition).

O., Sharon—Ohio River Edison Co., c/o Pennsylvania-Ohio Power & Light Co.—cranes for power plant and coal yard at Toronto, Ohio.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. N. Miller, Jr, Purch. Agt.—2 locomotive cranes for Bellaire and Mingo Jct., O., also 7½ ton whirler crane for river dock, Mingo Jct., O.

Va., Prince George—J. E. Cousins, Jr.—well drilling machine, well drilling tools, and 8 hp. gas or kerosene engine.

Wash., Seattle—Pacific Steamship Company, L. C. Smith Bldg.—electrically operated, cargo handling equipment for proposed ocean shipping terminals to cost between $3,000,000 and $4,000,000.

Wis., Appleton—Northern Boiler & Structural Iron Co., E. Kottke, Mgr.—one 10 ton electrically operated crane and one 5 ton hand operated crane.

Wis., Milwaukee—Milwaukee Steel Fdry. Co., 127 South Water St.—additional steel foundry equipment for proposed 1 story addition.

Que., Montreal—Loyal Oil Co., Ltd., 112 St. James St., F. Marchand, Pres.—refining equipment for petroleum oils and by-products.

Que., Montreal — M. A. Pratt, Ltd., 38 Notre Dame St. W., A. Pratt, Purch. Agt.—complete machinery equipment for the manufacture of pianos and gramaphones.

Que., Montreal—Quebec Liquor Comn., P. O. Box 1800, G. A. Simard, Pres.—complete bottling plant for Quebec City.

Que., Montreal — Sources Montreal — Viauville, Ltd., 388 Bleury St., O. M. Manseau, Purch. Agt.—complete bottling equipment for mineral, aerated and other waters.

Que., St. Malthieu de Caxton—A. Melacon (blacksmith)—forge, borer and other equipment.

Que., Shawinigan Falls—Barie & Frere, A. Barie, Purch. Agt.—additional sash and door manufacturing equipment.

Que., Three Rivers—Miller Brass Fdry., Ltd., 25 Hertel St.—additional equipment for foundry.

Metal Working Shops

Calif, Los Angeles — Unger & Watson, c/o Milwaukee Building Co., Wright Callendar Bldg., awarded the contract for the construction of a 4 story, 90 x 275 ft. garage and loft building on Figueroa St. Estimated cost $250,000.

Conn., Waterbury — The Bristol Co., Platts Bridge, (recording instruments) awarded the contract for the construction of an additional story to present 1 story 47 x 100 ft. factory. Estimated cost $40,000.

Ill., Chicago—Stewart Warner Speedometer Corp., Lincoln and George Sts., awarded the contract for the construction of a 6 story, 141 x 217 ft. addition to its factory. Estimated cost $750,000. Noted July 5.

Mo., St. Louis—Buick Auto Mfg. Co., Flint, Mich., awarded the contract for the construction of a 1 story, 22 x 38 ft. addition to its auto manufacturing plant at Natural Bridge. Estimated cost $10,000.

Mo., St. Louis—The Trade Realty & Investment Co., 111 North 7th St., awarded the contract for the construction of a 2 story, 100 x 124 ft. garage on Washington Ave. Estimated cost $55,000 Noted May 24.

O., Cleveland Heights (Warrenville P. O.)—M. J. Bender, 5510 Woodland Ave., Cleveland, awarded the contract for the construction of a 4 story garage, Manfield and Noble Sts., here. Estimated cost $40,000.

O., Euclid—F. F. Spieth, 343 East Scarborough Rd., Cleveland Heights, awarded the contract for the construction of a 1 story, 40 x 100 ft., commercial building and garage, here. Estimated cost $40,000. Noted July 12.

Pa., Dubois—Miles & Co. awarded the contract for the construction of a 1 story, 50 x 80 ft. garage. Estimated cost $40,000.

Pa., Phila.—The Apex Machine Co., 2801 West Susquehanna St., awarded the contract for the construction of a 1 story machine shop on Stenton and Wyoming Sts. Estimated cost $35,000. Noted May 3.

Pa., Phila.—The Budd Wheel Co., 23rd and Westmoreland Sts., awarded the contract for the construction of a 1 story addition.

Pa., Pittsburgh—C. J. Allen, c/o City Bank, 6112 Penn Ave., awarded the contract for the construction of a 2 story, 66 x 200 ft. garage on Denny and Mifflin Sts. Estimated cost $90,000.

Wis., Madison—French Battery & Carbon Co., c/o A. O. Olman, 1133 Rutledge St., awarded the contract for the construction of a 2 story 60 x 150 ft. factory unit and warehouse on Winnebago St.

Ont., Hamilton—Canadian Westinghouse Co., Traders Bank Bldg., Toronto, awarded the contract for the construction of a 3 story, 80 x 200 ft. electric manufacturing plant on Aberdeen Ave. Estimated cost $200,000. This is the first building of an extensive program, estimated to cost $1,250,000. Noted June 21.